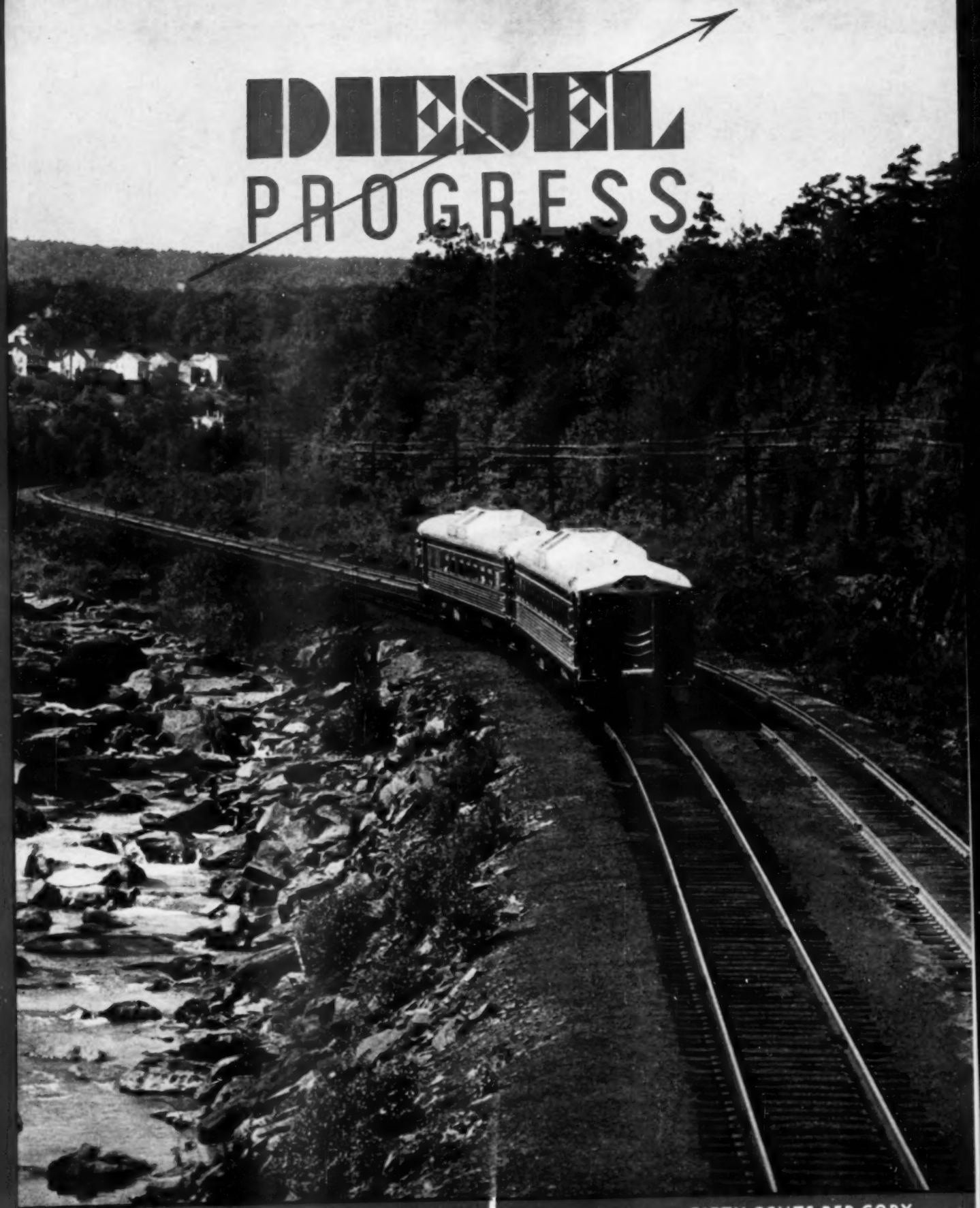
DIESEL PROGRESS

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR



FIVE DOLLARS PER YEAR

OCTOBER, 1952

FIFTY CENTS PER COPY

LESS THAN .001" WEAR PER 1,000 HOURS . . .

Dual-fuel engine protected with TEXACO URSA OIL

Let Thomas Cooper, Chief Engineer of the Weatherford, Texas, municipal power plant, tell the record of this Texaco-lubricated engine in his own words:

"We installed this Fairbanks-Morse, 10-cylinder, 2,000 h.p. engine in December, 1948 and operated it as a Diesel for 7,446 hours. It was converted to dual-fuel operation in March, 1951 and has run more than 5,000 hours since then.

"We have disassembled the engine once each year for inspection — the last date being February, 1952. Average cylinder wear was less than .001" per thousand hours, and no bearing wear at all could be detected. Original rings are still in use. Engine was very clean.

"We give the *Texaco Ursa Oil* used for lubrication a large share of the credit for this record and for keeping our maintenance costs low."

Similarly fine results follow wherever *Texaco Ursa Oil* is used, whether in Diesel, gas or dual-fuel engines. There is a complete line of these famous oils, approved by leading engine builders and used by operators everywhere. In fact —

For over 15 years, more stationary Diesel h.p. in the U.S. has been lubricated with Texaco than with any other brand.

A Texaco Lubrication Engineer will gladly give you full details. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

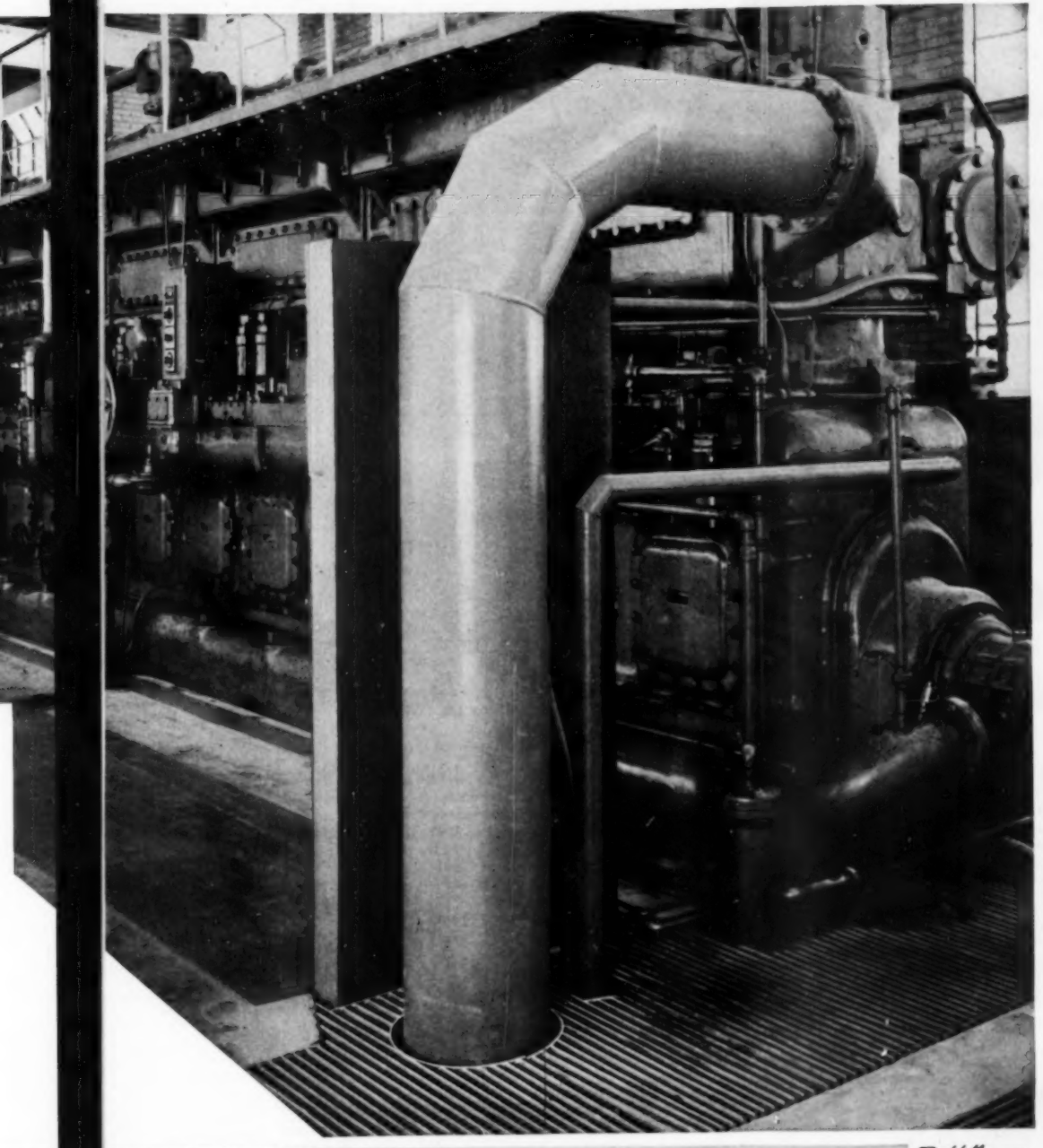
TUNE IN:
Tuesday nights
on television —
the TEXACO STAR THEATER
starring MILTON BERLE.

See newspaper for
time and station.

TEXACO

TEXACO

DIESEL PROGRESS for October, 1952, Volume XVIII, No. 10. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 816 North La Cienega Boulevard, Los Angeles 46, California. Rex W. Wadman, President. Subscription rate: $5 per year, single copy 50c. Acceptance under 34.64, P. L. & R., authorized.

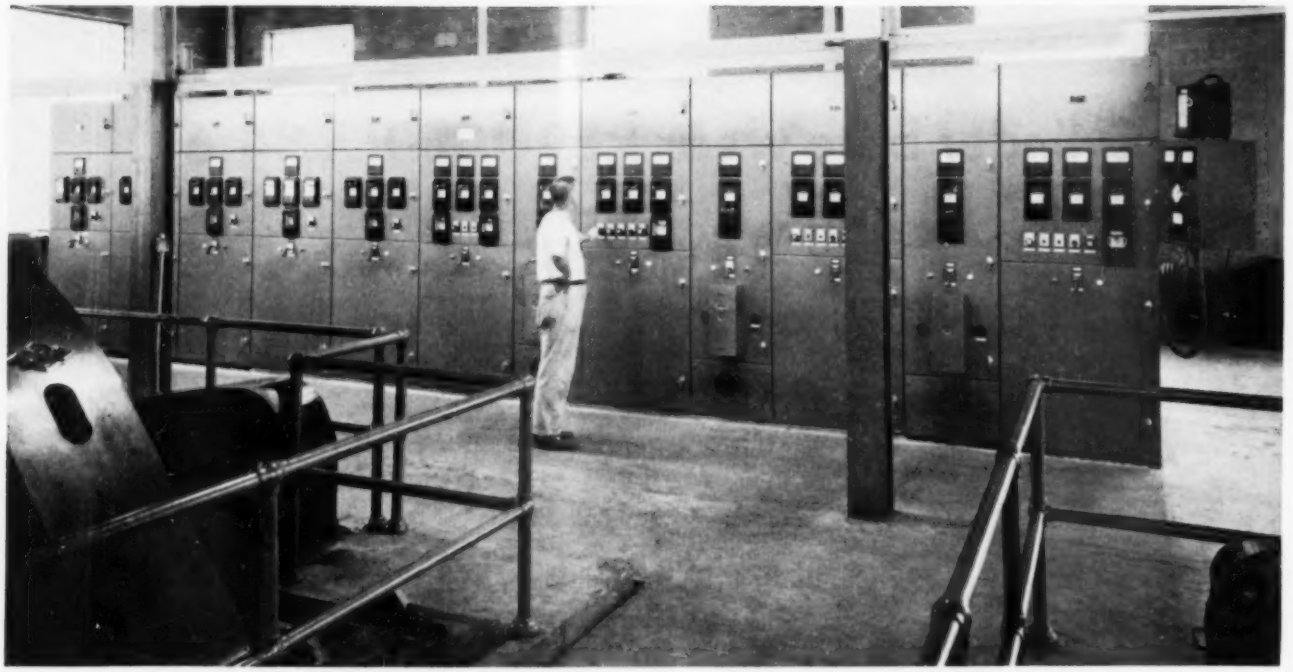


URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

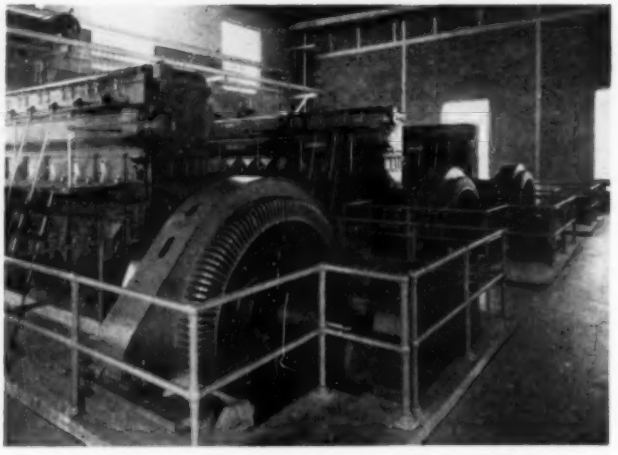
Faithfully yours

TEXACO 50

for Fifty Years



...brand new from the ground up



THREE TIRELESS E-M GENERATORS work at the new Bellefontaine plant, direct-connected to powerful diesels. E-M Generator frames are welded, rolled steel. Coils are specially insulated for high dielectric strength. Operating characteristics are perfectly matched to companion E-M Switchgear.

All major electrical equipment is E-M at new Bellefontaine, Ohio power plant

The Bellefontaine engineer in the picture above is operating a masterpiece of modern Switchgear design.

He can see that the E-M Switchboard has a clean, sleek, attractive appearance. And he knows that behind this shiny face is a Switchgear system second to none. These are the reasons E-M has been chosen prime supplier of electrical equipment at Bellefontaine and at so many other new plants:

E-M Switchgear and Generator engineers are *specialists* . . . they select and blend together pre-engineered components into integrated combinations *matched exactly* to the individual plant's requirements. It takes extra-value engineering to do this well, as standard combinations just don't come close enough to intricate modern plant specifications.

E-M also applies high standards of quality . . . above ordinary commercial standards . . . to all components. Circuit breakers, disconnects, switches, meters, panels and accessories . . . all have an extra margin of durability . . . a bonus value that will add years to plant operating life.

Your nearest E-M field engineer will be glad to tell you how E-M tackles such a job, and what successes we have had. For general background, write for Publication No. 194 on E-M Switchgear and No. 196 on E-M Generators.

ELECTRIC MACHINERY MFG. COMPANY

MINNEAPOLIS 13, MINNESOTA

This is the E-M Equipment at Bellefontaine:

THREE 1250 kva, 360 rpm, 2400/4160 volt E-M Engine-Type Synchronous Generators . . . 1000 kw at 0.8 leading power factor.

THREE 15 kw, 1750 rpm, 125 volt shunt-wound Belted Exciters.

TWELVE-PANEL SWITCHGEAR, *including:* Six generator and exciter panels, with 600 amp. d.c. electrically-operated breakers and heavy duty oil switches with 50,000 kva interrupting capacity.

Five feeder panels with induction-type overload relays. Swing panels with synchroscope, frequency meter and synchronizing lamps.

Incoming line panel and panel mounted voltage regulators.

4200-TPA-2119

SPECIALISTS IN SWITCHGEAR AND GENERATOR ENGINEERING

SERVING THE DIESELS
THAT SERVE AMERICA

The W. C. Richardson, with new Diesel-powered cranes, unloads 4,000 tons of sulphur and is under way again in 11 hours.

DELCO-REMY
ELECTRICAL EQUIPMENT

Dependable Delco-Remy-equipped Diesel engines power the huge traveling cranes of this Great Lakes cargo carrier . . . bring new efficiency in loading and unloading.

Ashore or afloat, wherever Diesels serve America, you can expect to find reliable Delco-Remy electrical equipment—generators, regulators, cranking motors, switches, batteries—teamed with the Diesels for better operation, lower costs.

DELCO-REMY ELECTRICAL EQUIPMENT

A GENERAL MOTORS PRODUCT — A UNITED MOTORS LINE

DISTRIBUTED BY WHOLESALERS EVERYWHERE

Delco-Remy

DIVISION, GENERAL MOTORS CORPORATION
ANDERSON, INDIANA

DELCO-REMY • WHEREVER WHEELS TURN OR PROPELLERS SPIN

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT RPM Delo Oils

UNITS Allis-Chalmers HD 20's & 19's

OPERATION Clearing timber land for reservoir

CONDITIONS Heavy pulling and bulldozing

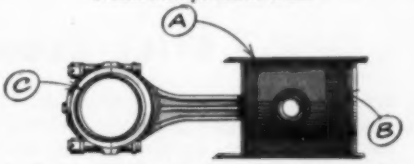
FIRM Paul C. Helmick Co., Seattle, Wash.

No stuck rings in 14 months of unusually tough work!

CLEARING 4000 ACRES OF TIMBER LAND in 14 months is the tough job being completed by these big Allis-Chalmers diesels, owned by Paul C. Helmick Co., Seattle, on Bureau of Reclamation job at Cascade, Idaho. Yet, lubricated with RPM DELO Special Lubricating Oil, there was not a single stuck ring or bearing failure in the entire period! Timber was pulled down in 30 ft. swaths by a 130 ft. anchor chain hooked to two of the 275-h.p. HD 20's; logs were bucked into piles and burned.

ENGINE PARTS WERE KEPT CLEAN by the special ingredients of RPM DELO Oils. The representative piston, sleeve, wrist pin, and con-rod bearing shown in this unretouched photograph, indicate the minimum carbon deposits. Assembly was pulled for inspection when the A-C unit was in for check-up... and put back in service as is.

How RPM DELO Oils keep engines clean and prevent wear



A. Contain special additives that provide metal-adhesion qualities...keep oil on parts whether they are hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean, helps prevent scuffing.

C. Special compounds stop corrosion of bearing metal, and oil foaming in both wet and dry sump engines.

There is an RPM DELO Oil to meet every heavy-duty engine operation condition.

FREE BOOKLET on the RPM DELO Oils gives you complete information. Write or ask for it today.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

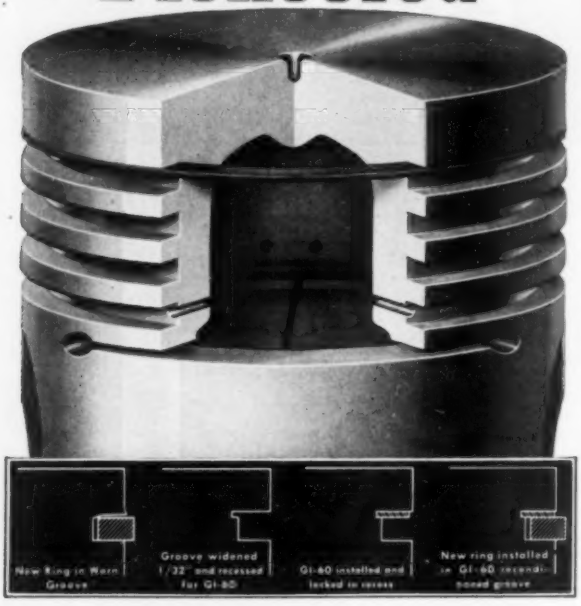
STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY
P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas

Sealed Power Pioneered

the only dependable, economical answer to top-ring groove wear



Sealed Power GI-60 Groove Insert

STILL ALONE IN ITS FIELD

Top-ring groove wear is a problem as old as piston rings. Top-ring grooves have always had the least lubrication, the most heat, the heaviest wear. Many remedies were tried. Regrooving and installing wider rings violated the intent of the engine designer. A loose, floating spacer amounted to the same thing as using a wider ring in two sections.

Sealed Power engineers wrestled with the problem for years, and came up with the only satisfactory answer to date. It is a heat-treated, spring-steel insert, securely anchored to the top of the ring groove, which has been regrooved to an absolutely true surface 1/32" wider than before. A recess 1/32" wide is cut at the top, and the insert locks itself permanently into this recess, held by its own inward tension, and dished to hug the top of the groove. It is called the Sealed Power GI-60 Groove Insert.

Many fleet owners are now using Sealed Power GI-60 on new replacement pistons, as well as re-conditioned pistons. One reports that since adopting the standard practice of installing GI-60, average piston life has been more than tripled.

Sealed Power GI-60 Groove Insert is only one of many improvements originated by Sealed Power Corporation, leader in the piston ring field since 1911.

SEALED POWER CORPORATION, MUSKEGON, MICHIGAN

Sealed Power Piston Rings

PISTONS • CYLINDER SLEEVES

Superior DIESELS

...provide dependable standby power for TOLEDO'S WATER SUPPLY SYSTEM

Because they are always ready for operation in emergencies these Superior Diesel generating units have "saved the day" many times by providing power for pumping water at the rate of 80,000,000 gallons daily.

Installed in 1941 to provide standby generating capacity for Toledo's Lake Erie Water Supply System, these Superior Diesels have handled every load imposed upon them.

Plant Superintendent, A. L. Warren, reports on the operating economy of this installation by citing one year's service record when 79,090 KWH were generated at an average cost of $.00673 per KWH. During this period 345,781,480 gallons of water were pumped.

For more detailed facts and figures on Superior and Atlas Diesels in municipal service, write the Engine Division at Springfield.

Superior ENGINES — ATLAS Imperial DIESEL ENGINES

DIESEL • DUAL FUEL • GAS

ENGINE DIVISION

THE NATIONAL SUPPLY COMPANY

PLANT AND GENERAL OFFICES:

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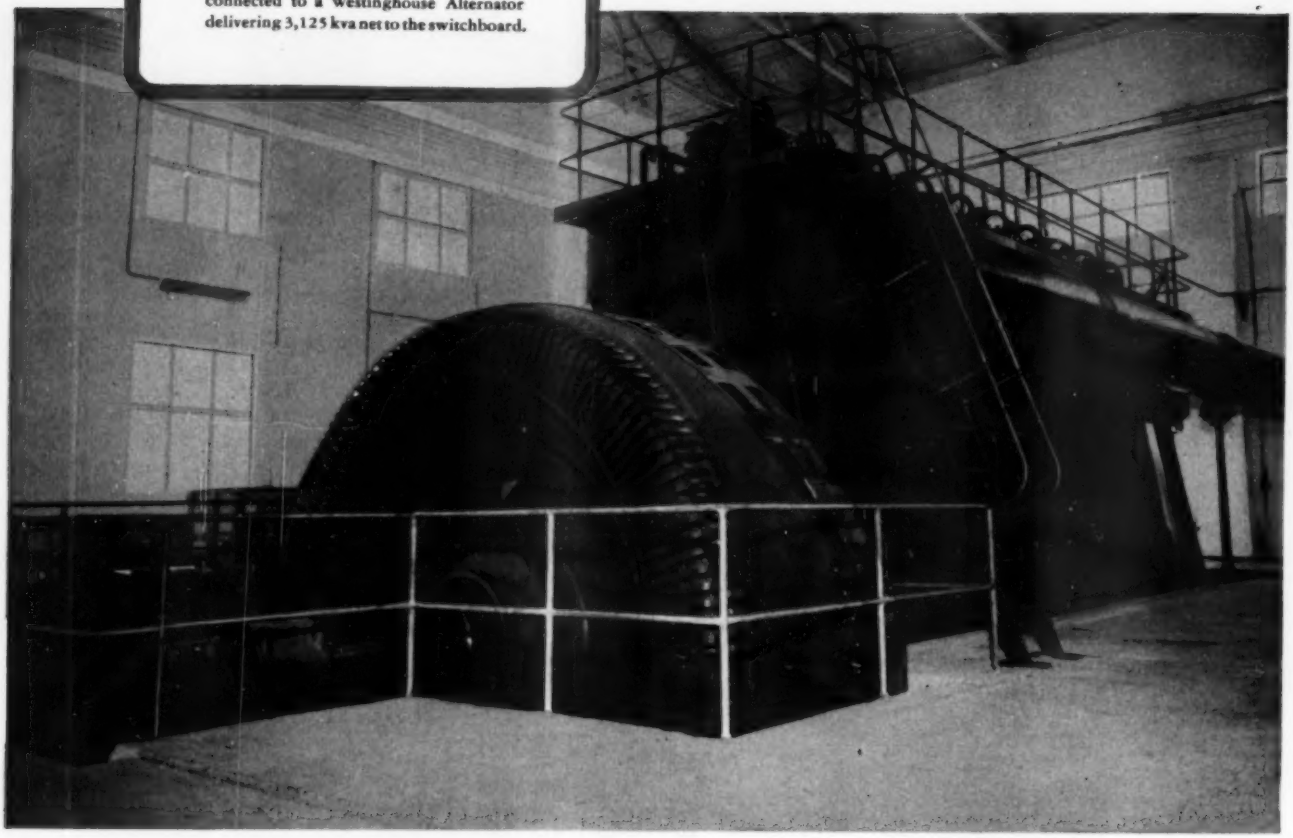
New York • Seattle • New Orleans

This is the first American-made engine generator unit installed at the power plant of the Bermuda Electric Light Co., Ltd. The Nordberg Diesel Engine is direct-connected to a Westinghouse Alternator delivering 3,125 kva net to the switchboard.



This generator unit turned the tide at Bermuda

Here is the first American generator unit installed at the Bermuda Electric Light Co., Ltd. Prior to 1939, all the generating units were of British make. This unit changed the pattern . . . consisted of a Westinghouse Generator and a Nordberg Diesel Engine. The outstanding performance of this unit was responsible for another similar installation in 1950.

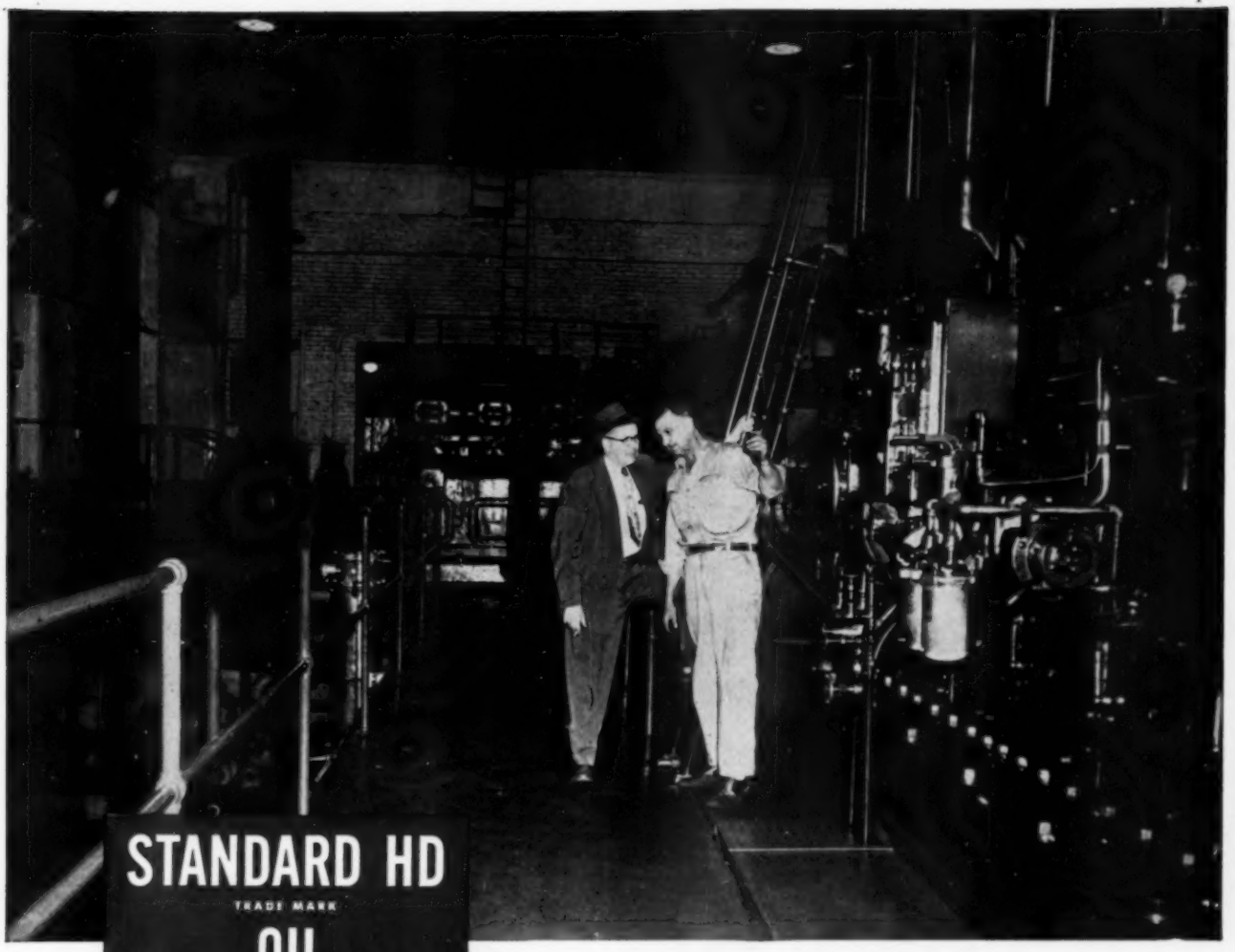
Westinghouse Generators create such acceptance because of their reliability—long life—performance. Once you specify Westinghouse you'll always specify Westinghouse. Take the fabricated steel rotor . . . it has been designed with such a high factor of safety that it is practically unbreakable. The all-steel frame makes possible a stator assembly having maximum strength and the permanent tightness of core that is necessary for a quiet, smooth-running machine. Electrical efficiency is tops, too . . . materials are so proportioned that the maximum efficiency of conversion is obtained from three-quarters to full load.

Call your Westinghouse Power Apparatus Specialist for complete consultation on your generator installations. He will work with you on the design, selection and application of the right equipment. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-10362

YOU CAN BE SURE . . IF IT'S

Westinghouse

A-C GENERATORS



Solves a diesel maintenance problem

• Excess cylinder and ring wear plus sludge, varnish, and carbon deposits posed a costly maintenance problem for operators of this municipal power station. Overhauls were scheduled every six months. A full set of rings was installed at every overhaul. That was the situation in 1947 when a Standard Oil lubrication specialist recommended changing to STANDARD HD Oil.

The change was made on one of the station's five diesels. These are the results with STANDARD HD.

Time between overhauls has been doubled, and normally only the two top rings are changed. Cylinder wear has been cut to a minimum, even with the engine operating under heavier loads. The engine has remained clean and there has been no ring sticking. Efficiency has been stepped up from an average of 12.0 KW per gallon of fuel to 12.5 KW per gallon.

These results, the solution of a costly maintenance problem, have led to the use of STANDARD HD Oil in the station's four other diesels. Chances are that a Standard Oil lubrication specialist can help you achieve similar results in the operation and maintenance of your own diesel equipment. Put him to work on your problem today. A call to your local Standard Oil Company office is all that's necessary. Or write: Standard Oil Company (Indiana), 910 South Michigan Ave., Chicago 80, Ill.

STANDARD OIL COMPANY STANDARD *(Indiana)*

GRANT GETS GRAVEL FOR 1.9¢ PER YARD (Fuel and lubrication costs) with an International UD-16 diesel plant running the pump.

Quarry Master in Nebraska

15 HOURS A DAY—is a normal task for the UD-16 lifting gravel 65 feet from pit bottom.

Lyle S. Gearhart, Superintendent of Grant Construction Company, Grand Island, Nebraska, gives the low-down on his International UD-16 power unit.

"You can't beat her for easy starting, and she pumps a good 600 yards every day on a 15 hour schedule," he says. "She delivers the gravel 150 feet on the level with a rise of 65 feet from the pond bottom up to the screen and hopper."

UD-16 Provides Steady Low-Cost Power Pumping Gravel for Asphalt Mix

All this means that Grant gets gravel at a cost of 1.9¢ per yard for fuel and lubrication. This kind of low cost power is the reason why gravel quarries all over the country are putting International units behind their pumps, crushers and conveyors.

Find out what your International Industrial Distributor or Power Unit Dealer can do for you. See why it pays to power with International.

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS

SEE YOU AT THE POLLS!

INTERNATIONAL

POWER THAT PAYS

"Ring and Cylinder Wear... Way Below Average"

Says Supt. R. Carlson,
City of Saint Louis, Michigan

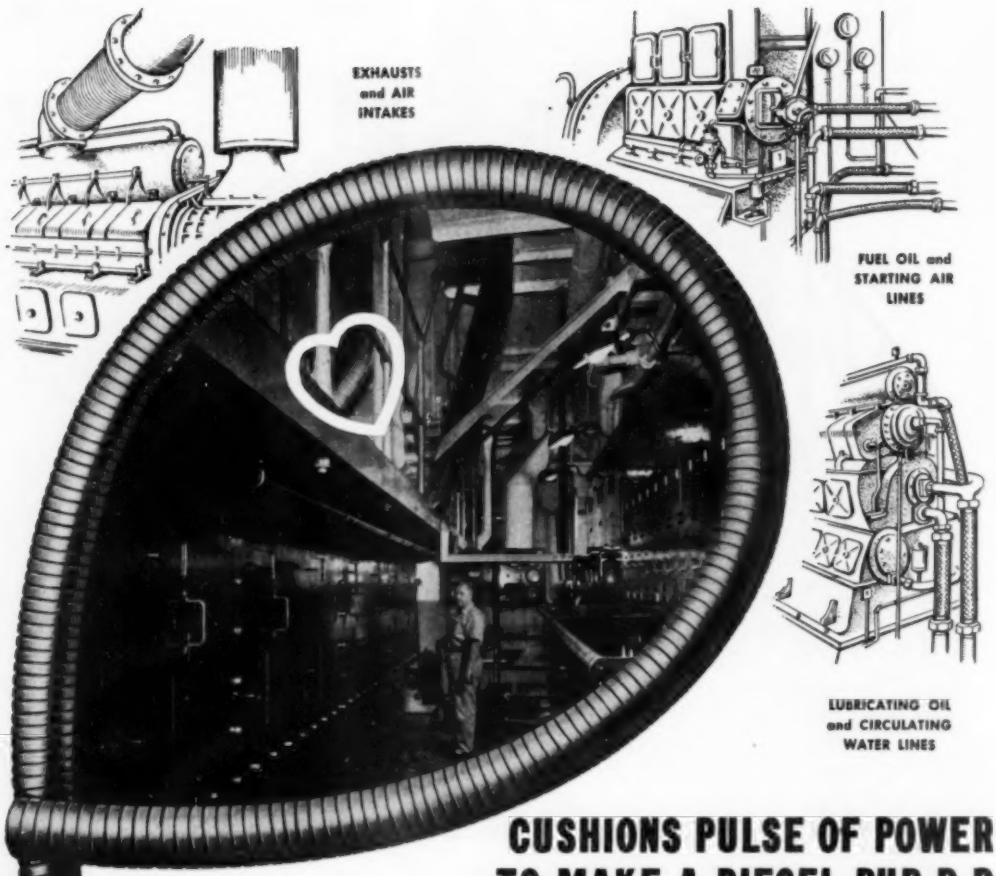
"Much of our Success is due to SINCLAIR GASCON OIL D"

The City of Saint Louis, Michigan, depends on diesels to furnish electric light and power... And Mr. Russel Carlson, Supt. of the Saint Louis power plant, depends on Sinclair GASCON OIL D to keep his large Nordberg and three large Fairbanks-Morse diesel engines humming 24 hours a-day—with an absolute minimum of downtime.

Says Mr. Carlson, "Experience has shown that our best results are obtained with Sinclair GASCON OIL D. Our engine cylinders and piston rings show minimum wear—*in fact, way below average.* We attribute much of our success to GASCON®."

Let Sinclair help reduce your engine wear. Contact your nearest Sinclair Representative or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR DIESEL LUBRICANTS
save wear and replacement



CUSHIONS PULSE OF POWER ...TO MAKE A DIESEL PUR-R-R

PENFLEX FLEXIBLE TUBING DAMPS VIBRATION OUT OF TUG "TITAN'S" DIESEL EXHAUST

As she "revs up" for action, the Nordberg Diesel in the powerful "Titan" just purrs like a kitten. One of the secrets of this big ocean-going tug's smooth, vibration-free power is "flexineering"—the scientific engineering of flexible metallic tubing to the specific requirements of the job.

Running from exhaust to stack is a flexible section of 18" Penflex interlocked metal tubing. As the "Titan" flexes its mighty muscles, Penflex flexes to soak up all vibration. Extra outer jacket provides efficient air cooling. Tubing is safe, tight as pipe — but flexible.

In the diesel power field — on exhausts and air intakes . . . fuel oil and starting lines . . . lubricating oil and circulating water lines . . . or the many other places where tubing is used — you'll find Penflex engineers ready and eager to help you solve your toughest tubing problems. For details on Penflex flexible tubing for all diesel applications, write today for your copy of Bulletin 71.

Pennsylvania Flexible Metallic Tubing Company, Inc., 7212 Powers Lane, Phila. 42, Pa.
Branch Sales Offices: **Boston • New York • Chicago • Houston • Cleveland • Los Angeles**

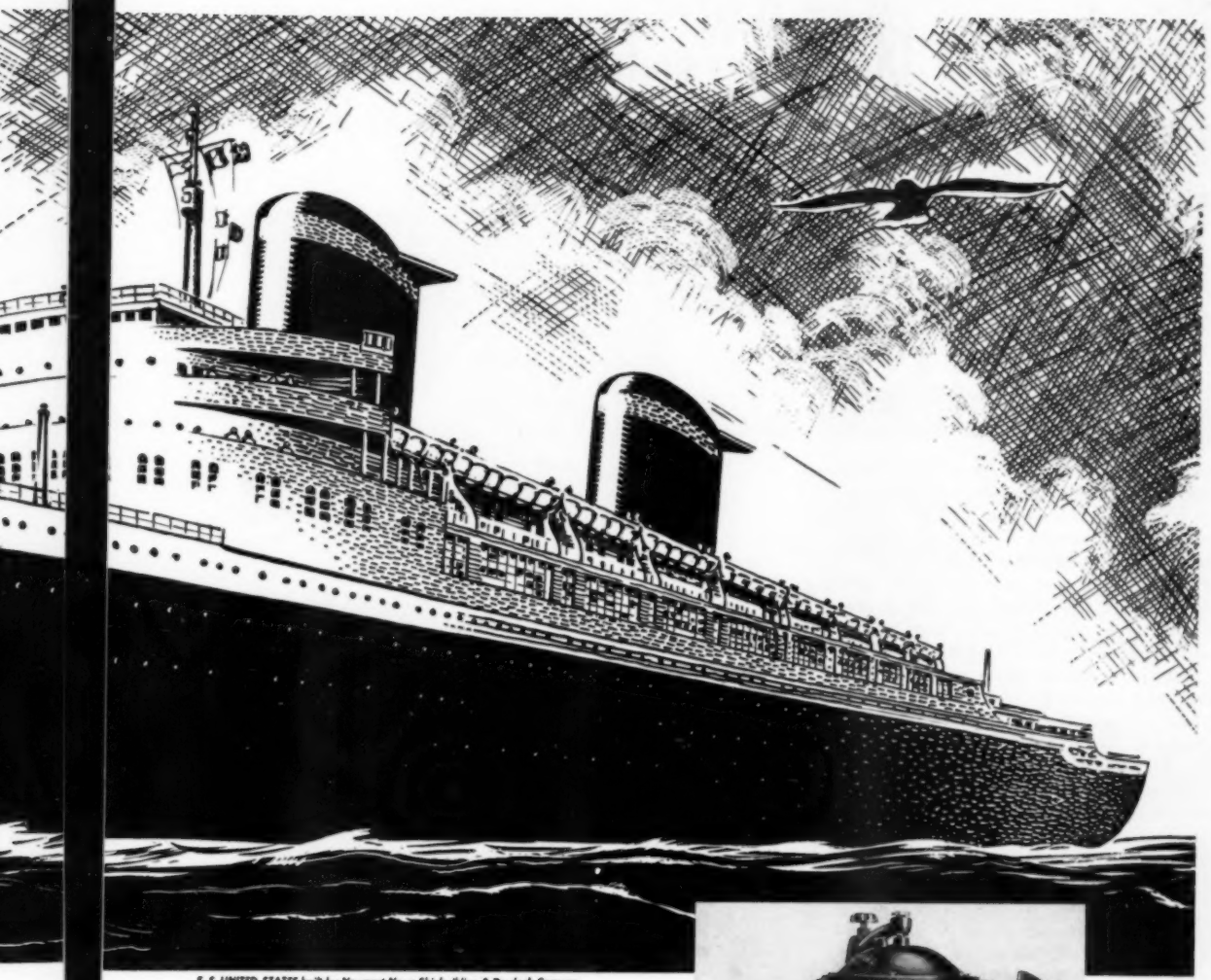
penflex

HEART OF INDUSTRY'S LIFE LINES

PROTECTED BY DE LAVAL OIL PURIFIERS

De Laval Oil Purifiers protect the main turbines of America's largest ship. Other De Laval centrifuges are installed on the S.S. "United States" for diesel fuel oil service. They insure that the oil for the diesel engines, driving auxiliaries, reaches injection nozzles clean and dry, hence in a condition to provide maximum BTU rating.

Wherever De Laval centrifuges are installed, whether in marine service or in some power plant ashore, they always do one basic job best—they protect the power unit by removing from lubricant or fuel both the undesirable solid impurities and all water. In all cases, De Laval machines are the best means obtainable for insuring against the troubles that wet or dirty oil can cause.

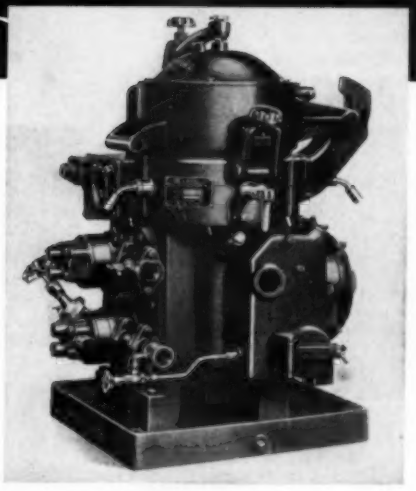


S. S. UNITED STATES built by Newport News Shipbuilding & Drydock Company

DE LAVAL

LUBRICATING AND FUEL OIL PURIFIERS

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO. 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited Peterborough, Ont.



De Laval "Uni-Matic" Oil Purifier

Savings up to 42% on fuel oil and lube oil

Fairbanks-Morse does it with dual-fuel engines

...all Ross Exchanger equipped!

"Put your power costs in order with Fairbanks-Morse dual-fuel engines." That F-M statement is based on facts like these:

In Minnesota, fuel costs cut 42 per cent. In a Kansas power plant, savings of $19,000 a year in fuel and lube oil. In Arkansas, overall savings of $33,000 annually!

To achieve such economies, many of the engines are in 'round-the-clock operation. Naturally, that means all components must give the same unfailing performance. Take the Ross Exchangers for example. They are and *can be* depended on to keep lube oil and jacket water at proper temperature levels. Downtime or lowered performance through overheating can't be risked.

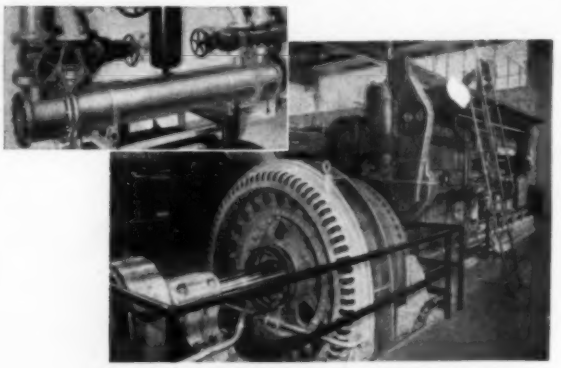
That's why, on Fairbanks-Morse installations, such as the ones shown, you so frequently find Ross Exchangers among the principal equipment. Fairbanks-Morse must safeguard its own in-built quality with components of equally known dependability.

For Diesel, gas or dual-fuel engines of any rating, pre-engineered Ross Exchangers have unequaled advantages: standardization that simplifies engineering, diversification of standard sizes to cover most requirements, and choice of materials for specific conditions.

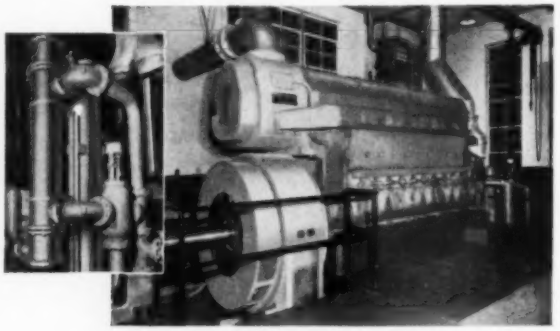
Details of construction, engineering data and collaboration on your specific needs gladly furnished. Bulletin 2.1K1 mailed on request.

KEWANEE-ROSS CORPORATION
DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION
1425 WEST AVENUE BUFFALO 13, N. Y.
In Canada, Horton Steel Works, Limited, Fort Erie, Ont.

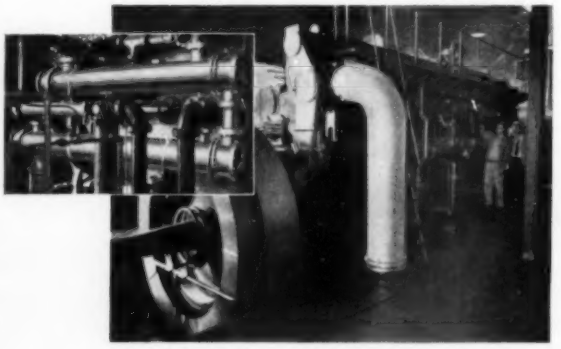
ROSS EXCHANGERS



Fairbanks-Morse 1400-hp dual-fuel engine equipped with Ross Exchanger for lube oil cooling.



Fairbanks-Morse 1600-hp opposed-piston Diesel equipped with two Ross Exchangers: one for jacket water, the other for lube oil.



Fairbanks-Morse 2000-hp dual-fuel engine equipped with two Ross Exchangers for lube oil and jacket water cooling.

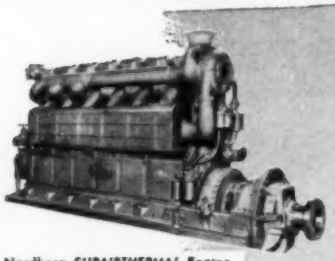
KEWANEE ROSS PRODUCTS

Serving home and industry

AMERICAN STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

FOR THE BEST SOLUTION TO YOUR POWER PROBLEMS...

LOOK TO NORDBERG

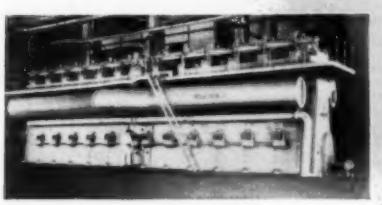


The Nordberg *SUPAIRTHERMAL* Engine, —outstanding development in the Diesel field, is available in a complete range of 4-cycle types for all applications, in sizes from 535 to 4270 H.P.—including Diesel, Duafuel, or spark fired gas operation.

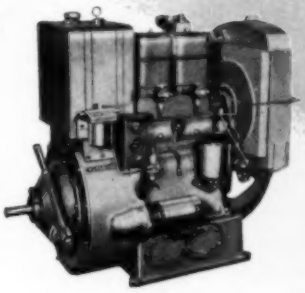
—builders of America's largest line of

HEAVY DUTY DIESEL ENGINES—

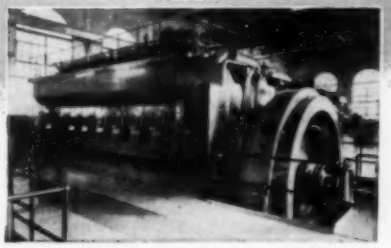
10 TO MORE THAN 10,000 HORSEPOWER



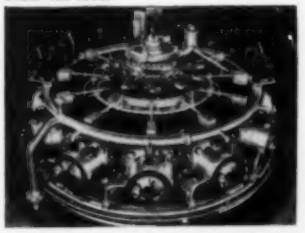
Nordberg 2-cycle Diesels for Marine or stationary service are built in a wide range of types and sizes, from 1570 to 10,800 H.P.



Nordberg "Packaged" Diesel Power Units —from 10 to 45 H.P., 6 to 30 K.W., for generating electricity, pumping, and straight power applications.



Nordberg 2-cycle Duafuel engines are built in a wide range of sizes from 1570 H.P. upward — all of which burn oil, gas, or any combination of both — and are instantaneously convertible from one fuel to another, under full load.



Nordberg 2-cycle Radial engines develop 1950 to 2125 H.P. or 1250 to 1500 K.W. at 400 R.P.M., as an oil burning Diesel, as a gas engine, and as a Duafuel engine.

P-SHM152-R

IN the complete line of Nordberg two and four-cycle oil burning and Duafuel Diesels and gas burning engines, you will find the right size and type of unit to meet your power requirements.

From the smallest to the largest engine, every Nordberg unit is built to deliver low-cost, dependable power . . . and the basic dependability of Nordberg engines has been amply proved in service on hundreds of successful stationary and marine power applications all over the world.

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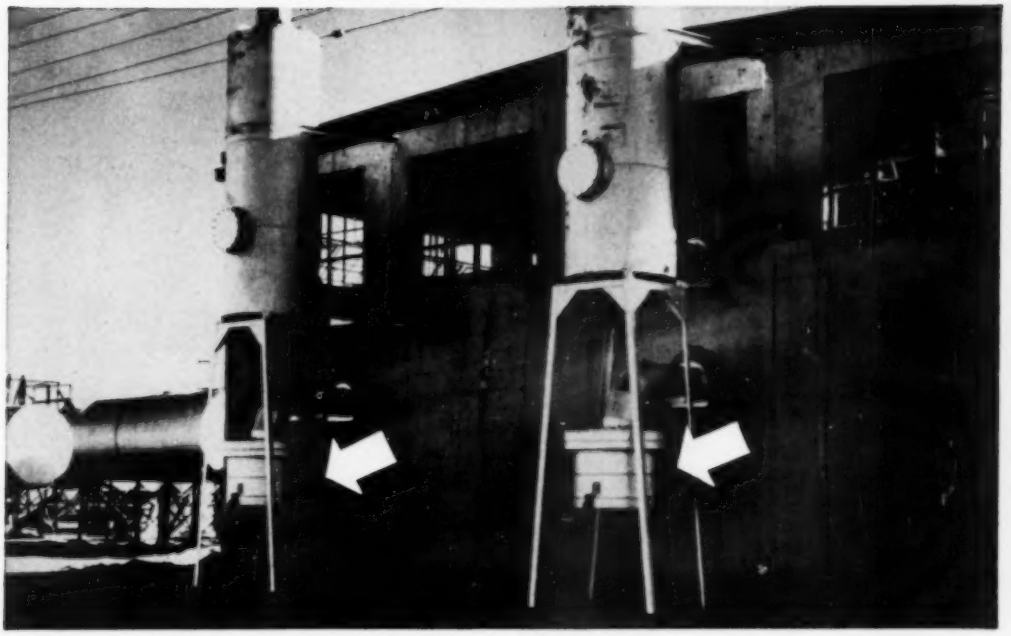
DIESEL ENGINES



Las Animas power plant picks AIR-MAZE oil-bath filters to protect Nordberg diesel

TO GIVE ITS NORDBERG 4-CYCLE, 8-cylinder diesel engine greatest protection against airborne dust, Las Animas Light and Power Company of Colorado equipped the air intakes with Air-Maze oil-bath air filters.

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Air-Maze oil-bath filters are available with either top or bottom outlets, with or without relief valves or back-fire valves. They are quickly serviced by draining dirty oil and refilling, yet can be completely disassembled when desired. And because Air-Maze oil-bath filters are more compact, you save on space.

Thousands of Air-Maze installations are delivering clean air to America's diesels. Leading diesel engine manufacturers specify them for the products they build. For full information on the hundreds of filter types and sizes engineered by Air-Maze, write the Air-Maze Corporation, Cleveland 5, Ohio.

PARTIAL LIST OF DIESEL ENGINE MANUFACTURERS USING AIR-MAZE FILTERS

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Nordberg Manufacturing Company
Cooper-Bessemer Corporation
Baldwin-Lima-Hamilton Corporation
Enterprise Div., General Metals Corporation
National Supply Co.
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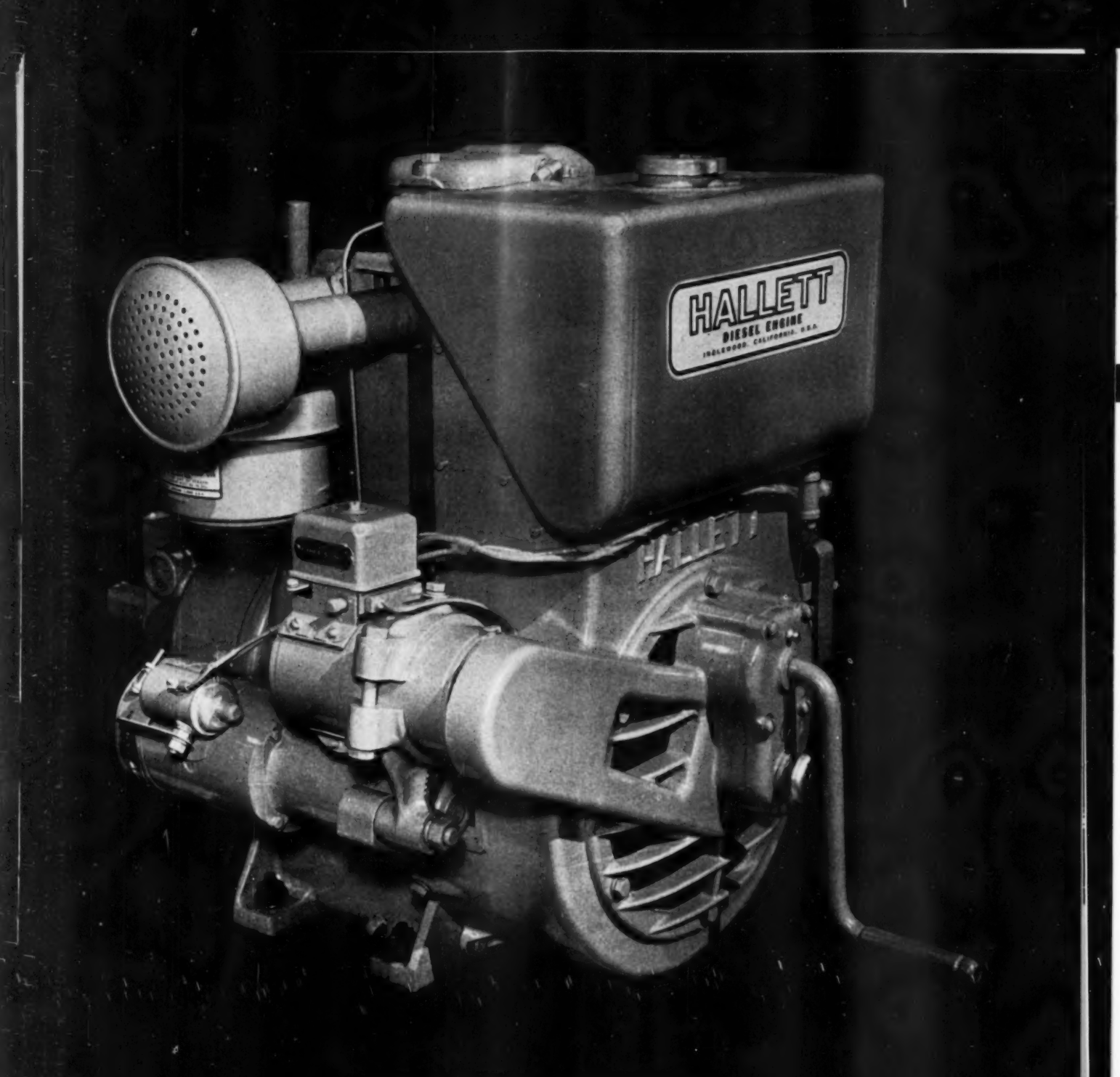
The biggest names in diesels are protected by Air-Maze filters

AIR FILTERS
SILENCERS
SPARK ARRESTERS

AIR-MAZE
THE FILTER ENGINEERS

LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS



Model AC-1 Air Cooled 5 HP Diesel Engine

HALLETT MANUFACTURING COMPANY

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CONTENTS FOR OCTOBER, 1952

EDITORIAL AND PRODUCTION OFFICES

816 N. La Cienega Blvd. Los Angeles 46, Calif.

BUSINESS OFFICES

NEW YORK 36: Wilbur W. Young, 2 West 45th Street, MUrray Hill 2-7333

LOS ANGELES 46: Sidney Hoffman, 816 N. La Cienega Blvd., BRadshaw 2-6273

LONDON E.C. 4: G. L. Fetherstonhaugh, St. Paul's Corner, Ludgate Hill

TULSA 3: O. F. Cozier, 515 McBirney Bldg., 4-5555

CCA

DIESEL PROGRESS for October, 1952, Vol. XVIII, No. 10. Published Monthly by Diesel Engines, Inc., 816 N. La Cienega Blvd., Los Angeles 46, California. Tel. BRadshaw 2-6273. Subscription rates are $5.00 for U.S.A. and possessions. All other countries $7.50 per year. Subscriptions may be paid the London office at £2-12s-6d per year.

DIESEL PROGRESS is indexed regularly by Engineering Index, Inc.

MPA

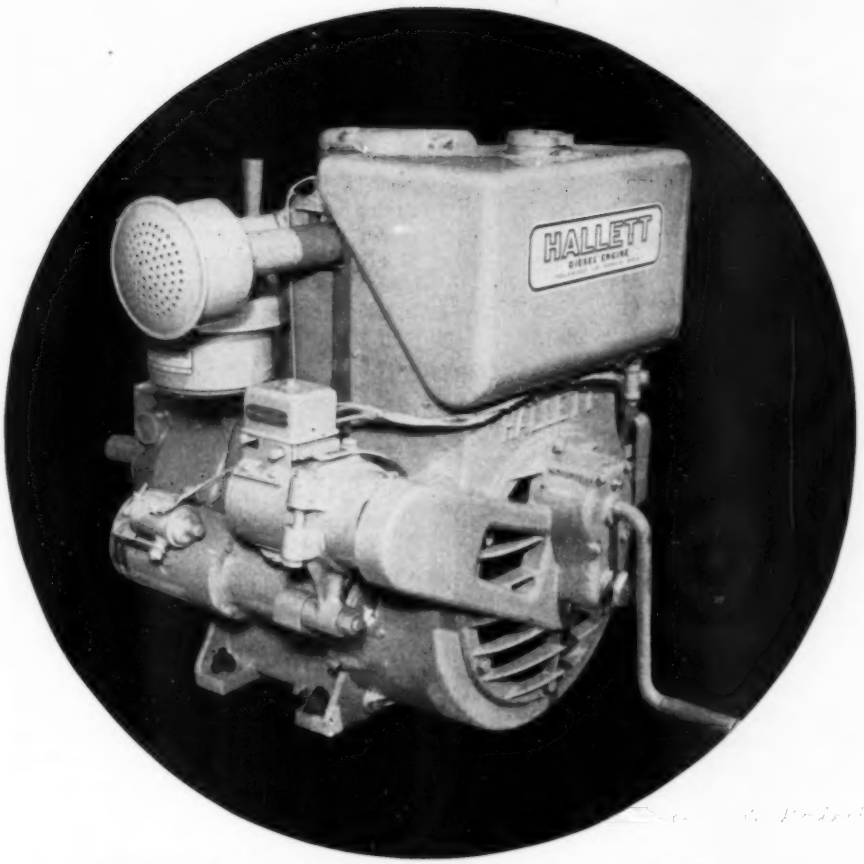
FRONT COVER ILLUSTRATION

Two Budd RDC self-propelled diesel cars on the Lehigh Valley Railroad. The cars can be used singly or coupled together as a train.

HALLETT ALUMINUM DIESEL

Single Cylinder, Air Cooled, Four-Cycle, Valve in Head, Vertical Type, 5 1/2 bhp. at 1800 rpm. Aluminum Diesel Developed and Manufactured by Hallett

By REX W. WADMAN



Quartering view of the new Hallett air-cooled 5½ hp. diesel engine showing the Electric Auto-Lite electric starter; the Air-Maze air filter; exhaust muffler.

ONE of the most interesting small diesel engines to be developed in these United States in recent months is the 2½ kw. diesel generator set driven by the air-cooled aluminum single cylinder diesel, developed by the Hallett Manufacturing Company. As will be seen by the illustrations, it is a single cylinder, air-cooled, 4-cycle, valve in head vertical type, 3½ in. bore, 3⅝ in. stroke, with a piston displacement of 34.8 cu. in. The engine is rated at 5½ bhp. at 1800 rpm. with the maximum of 6 bhp. at 1800 rpm.

The cylinder and head are cast with radiating fins in one unit with valve chambers cast integrally in the head. Valves are heat treated, silichrome steel, positioned vertically in the cylinder head. Valve springs, rocker arms and compression release cam are enclosed in an aluminum housing bolted to the head. Valve mechanism is positively lubricated from a crankcase pump through a lubricating oil filter.

Crankshaft and connecting rods are drop forged heat treated steel with 2⅛ dia. x 1¾ long crank bearing. Main bearing is a Timken Taper roller type. Conecting rod crank bearings are Federal Mogul, steel backed, copper lead faced insert, tin plated.

Piston and piston pin—the piston is a permanent mold casting of heat treated aluminum alloy with 1⅛ diameter piston pin, full floating type with Tru-Arc retainers. The piston carries three standard 3/32 in. compression rings, one combination 20° ring above piston pin, and one ⅞ in. oil cutter ring below, all American Hammered.

The injection system consists of a high pressure solid injection with American Bosch injection pump and ejector. Nozzle type, Pintle S.

The crankcase is of cast alloy aluminum with hold-down lugs on crankcase base.

Starting is manual with a hand-operated compression release. Crank may be folded and latched to shroud. Crank is geared 2:1 ratio. But a starting motor for electric starting can be supplied and is of the automotive 12 volt type integrally mounted on crankcase hand-hole cover.

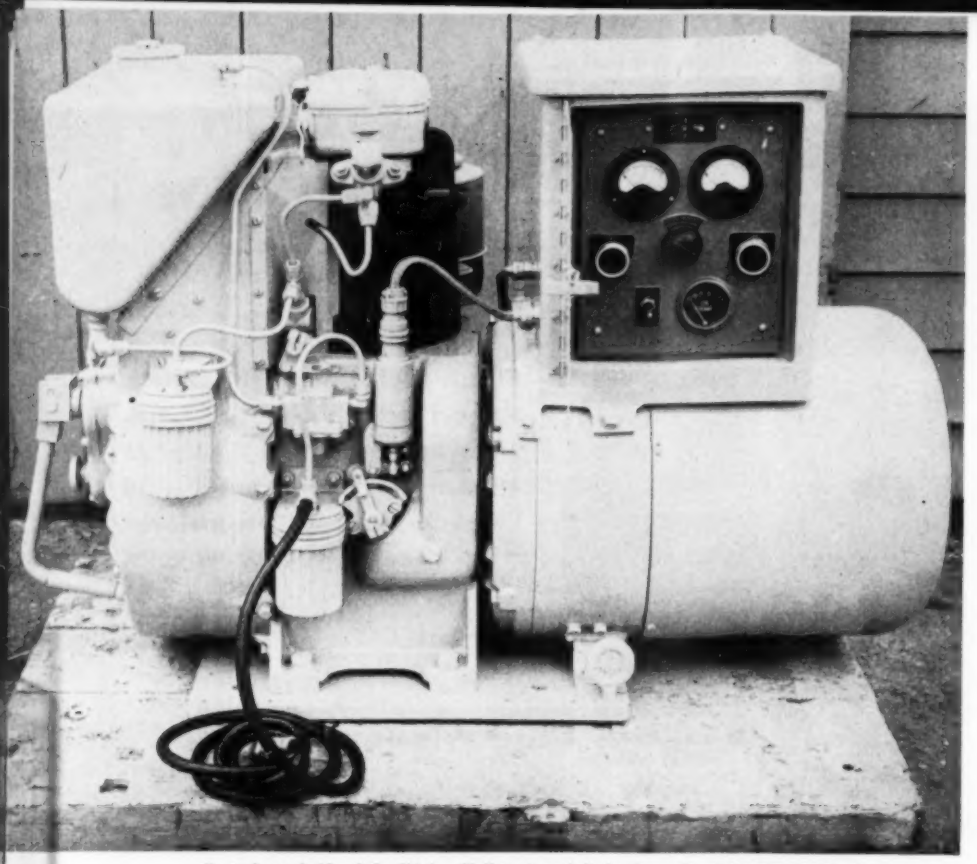
The generator is rated at 2½ kw. with a power factor of 0.80, 115 v. ac. 60 cycle, at 1800 rpm. It is of the Class B insulation type with open drip-proof enclosure for continuous duty. Bearings are sealed cartridge type, efficiency 78% and it is wound for 3 wire 115/230 V. 1 phase, connected for 2 wire 115 V. 1 phase operation. The field current is 2.8 amps maximum at 115 V. ac. output. Rated load current is 27.0 amps at 2.5 kw., 0.80 power factor.

Controller—The housing for the controller is of cast aluminum with flush-locking hinged door. Operating instructions for the unit are fastened to the inside of this door. The output terminals in the junction box are covered by an access plate, and the top cover is removable. Leads from the generator to the control panel enter bottom of the housing. Leads from the control panel to the fuel pump shutoff solenoid and from the control panel to the starter solenoid are sheathed in flexible metal conduit. The control panel is of sheet aluminum, mounted on vibration dampers in the control housing. The controls themselves, mounted on the control panel consist of (1) an oil temperature gauge, (2) Switch-4 pole, double throw for switching to manual voltage control, (3) Start button, (4) Stop button, (5) Voltage adjusting rheostat, (6) Voltmeter, (7) Ammeter, (8) Circuit breaker —magnetic type.

A voltage regulator is mounted on the underside of the control housing cover behind the control panel in the control housing. A manual control rheostat is mounted in the control housing with its handle protruding on the outside of the control housing for manual control of voltage regulation in lieu of automatic voltage regulation.

This Hallett diesel has been tested to conform with Navy Department specifications on fuel of 7-0-2, cetane number 50. Alternate fuels, common diesel, number 3 fuel oil. Crude oil, not heavier than 26 API gravity. Average consumption 0.47 pounds fuel per bhp. hr.

The fuel system is emergency type design, auxiliary tank on engine supplied by transfer pump from any optional source available within reach of the six foot flexible suction tube.



Control panel side of the 2½ kw. Hallett air-cooled aluminum diesel showing the Bosch fuel pump and injector at the top; the two Purolator fuel oil filters in foreground.

The lubricating oil specifications of this Hallett diesel are Navy 9000 series SAE 30 or Army 2-104-B. SAE 30 for normal use, SAE 10-W for 29° or lower. Jet system from reciprocating pump mounted in crankcase.

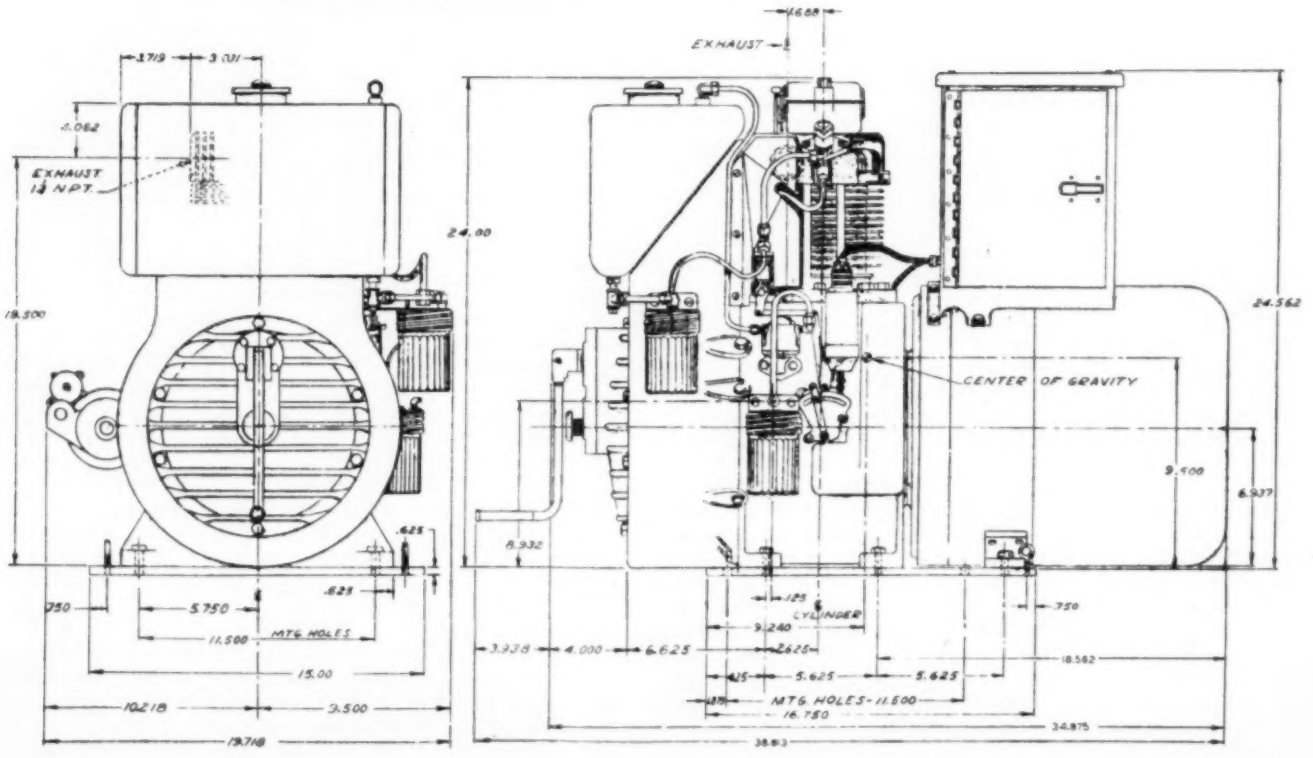
The cooling air is induced by blower, the blades of which are cast integrally on the flywheel. The air shroud, housing the combination flywheel and blower, is of cast aluminum. The shroud has directional vanes for channeling the air to the cylinder and cylinder head. Attached to the shroud is the intake air grill and gear box supporting the 2:1 ratio safety hand-cranking mechanism.

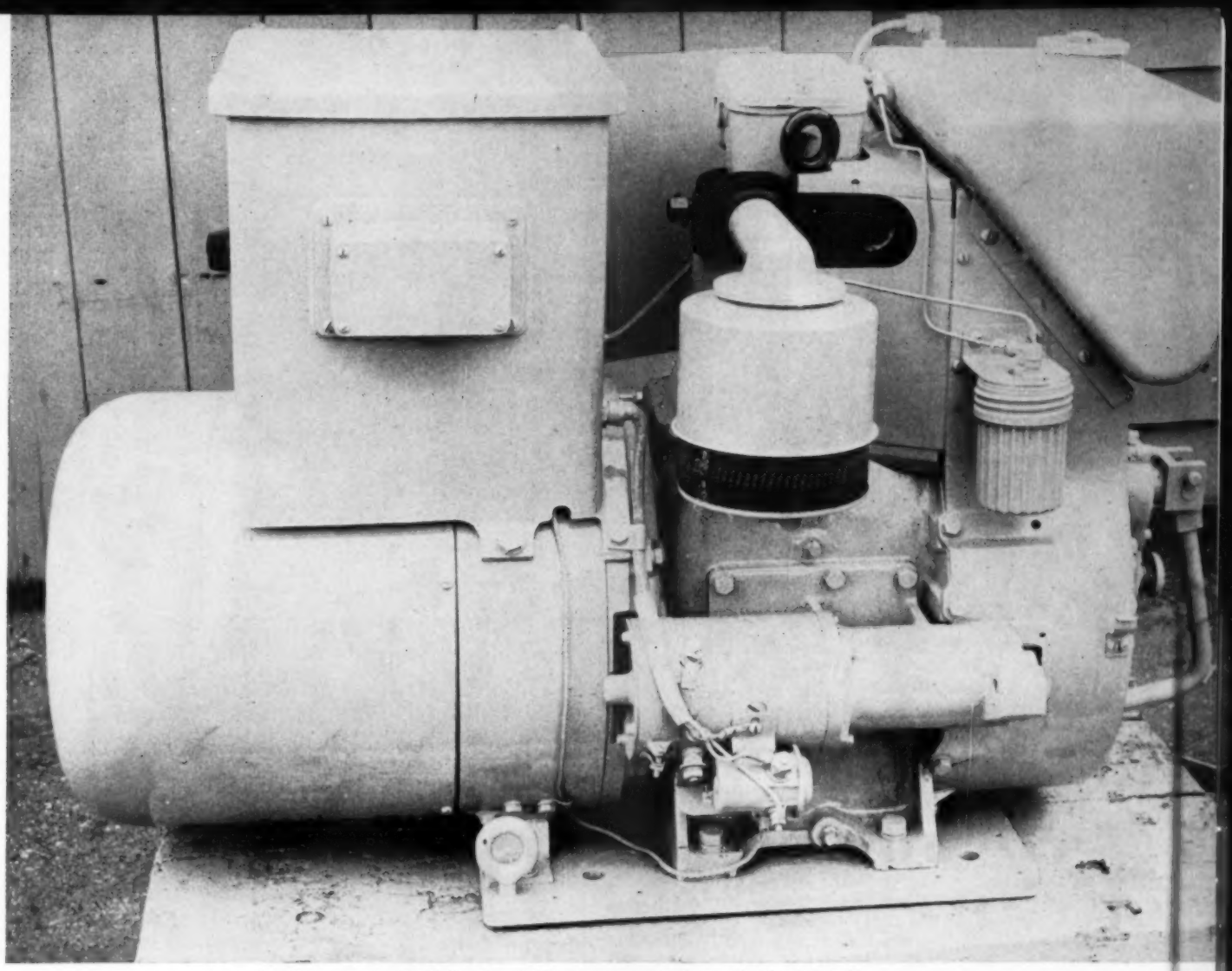
The disposition and arrangement of accessible parts of the engine, viewing the unit from the forward or shroud end are: (1) On the right—The governor control, fuel injection pump, fuel injector, fuel transfer pump, fuel oil filters and a solenoid magnet operated by a suitable electrical contact to provide remote control shut-down of the engine by actuating the governor control arm. Speed regulation is accomplished by adjusting the governor control lever. (2) On the left—The electric starter, the lubricating oil filter, the intake air filter, the combination crankcase breather, and oil dipstick, and the engine exhaust port.

A compression release lever is conveniently located on the rocker box cover to facilitate hand cranking. A wick plug is also provided for cool weather cranking, and may be also used to facilitate battery starting in cool weather.

Generator Mounting and Alignment—The power take-off end of the crankshaft is accurately tapered and fitted with a Woodruff key to accept the mat-

Dimensional drawing of the 2½ kw. Hallett air-cooled diesel generator set. Note extreme compactness and ease of installation.





Electric starter side of the Hallett air-cooled 2½ kw. generator set showing the Electric Auto-Lite electric starter in the foreground; the Air Maze air filter above it; and to the right the Purolator lube oil filter. The Kittell muffler fits into the exhaust port to right of air filter.

ing end of the generator armature shaft. The end of the crankshaft is also drilled and tapped to provide for a draw bolt to rigidly connect the armature to the crankshaft.

Accurate alignment between the engine and generator is made possible by a unitized end bearing plate and generator mounting flange housing the Timken main bearing. An end bearing, centralized by the generator shell, carries the extreme end of the armature shaft thereby preventing vibration and whip on the commutator end of the armature.

These features provide particularly smooth operation of the brushes. This method of mounting utilizes the armature in true flywheel effect and reduces cyclic frequencies and damage to the armature winding through operative vibration to a minimum.

The lubricating oil system comprises a reciprocating pump unit operated from the camshaft. A jet nozzle connected to the pump outlet directs oil against the connecting rod bearing and connecting rod causing a deluge of oil in the crankcase when the engine is operating. The pressure of the oil is very low and semi-intermittent. It has only sufficient pressure to force a small quantity of oil through the filter to lubricate the valve mechanism.

Approximately one and one-half to two quarts of oil per minute are jetted in the crankcase for lubrication and bearing cooling. Oil filtration rate serving for valve mechanism lubrication is approximately one quart in four hours.

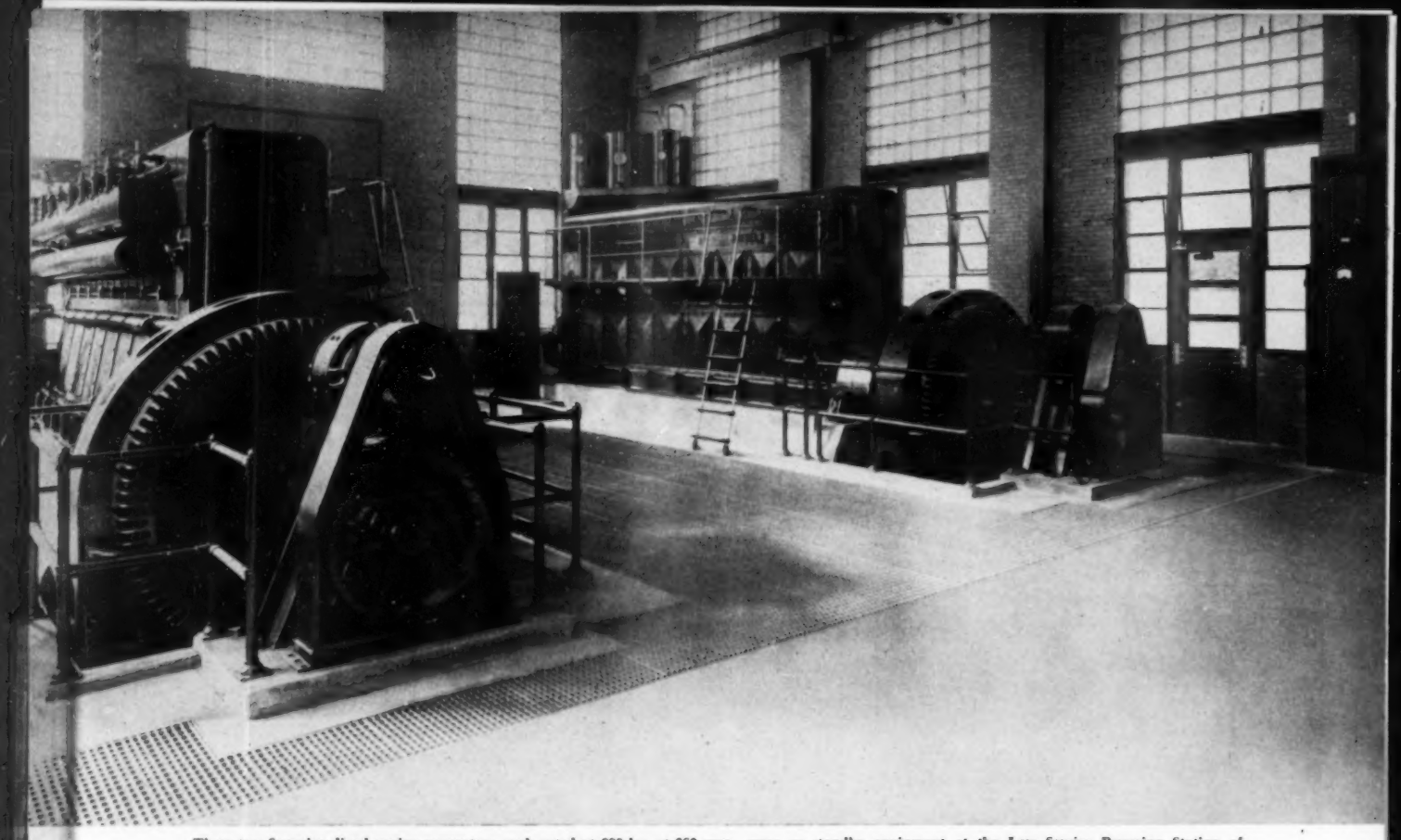
The engines and generators insofar as it has been deemed possible within good design are of lightweight construction. To accomplish this all possible iron and steel parts have been replaced with appropriate aluminum sheet, plate, and castings.

The generator has been cut down to the requirements of iron and steel necessary for the functioning of the electrical end. The balance of the generators, such as the end bearing plates, bearing supports and shell are of aluminum.

Critically stressed parts, such as the crankshaft connecting rod, studs, cap screws, and nuts are manufactured from heat treated steel. The cylinder is cast of sorbitic iron.

The generator is a quill-mounted unit and is attached as explained in the engine description. Ventilation aad cooling of the generator is provided for by central louvers in the generator shell which houses the centrifugal fan mounted on the armature shaft. Foreign matter entering through the shell is centrifuged to the inner surface of the shell permitting clean air to pass over the brushes and through the coils exhausting the air through louvers provided in the generator adaptor plate. It will be noted that the air passing through the generator is counter-flow to the air passing through the engine preventing the possibility of heated engine air entering the generator.

The diesel generator set may be mounted on combination low impact shock and vibration damper mounts designed to absorb the engine vibration and prevent local vibration transmission. However, these may be eliminated if the installation so requires, but careful shimming must be resorted to in such cases.



These two Superior diesel engine generators, each rated at 900 hp. at 360 rpm., serve as standby equipment at the Low Service Pumping Station of Toledo's Lake Erie Water Supply System. They have "saved the day" on numerous occasions when the normal power source failed.

TOLEDO, OHIO

By DOUGLAS SHEARING

TWO diesel engine generators, installed as standby units in the Low Service Pumping Station of Toledo's Lake Erie Water Supply System, have "saved the day" on several occasions since their installation in 1941 by successfully handling the load during emergency operations. The system delivers 80,000,000 gallons of water daily, serving 325,000 people. Water enters an intake crib two miles off shore and moves by gravity through an intake conduit to the Low Service Pumping Station. Here the water is lifted and delivered to a Chemical Building for purification, after which a High Service Pumping Station sends it farther along its way.

Normally the power required to run the Low Service Pumping Station motors is furnished under contract by the Toledo Edison Co. But two Superior standby diesel engine generating sets, each rated at 900 hp. at 360 rpm., are kept in readiness to take over whenever necessary. In 1948, for example, the standby diesels were called on in three emergencies caused by complete failure of purchased power for a total of 64.5 hours. (See Table I) On January 1, a severe sleet storm cut off power for 52.15 hours. Power was not restored until January 3. During this time, both Superior engines were brought into use. On March 19, and again on March 20, purchased power failed because of heavy winds. On July 22, 1951, an electrical storm caused another breakdown by knocking out lightning arresters and the engines immediately took over for 3.75 hours. During this period, 1370 kwh. were produced with low fuel consumption. The longest emergency run occurred on June 23, 1944, when an electrical storm put both Edison lines out of service. During this run, the Superior diesel units handled the load with ease until service was restored. On January 19, 1944, the power was off one side of the switchboard because of repairs made on the power lines. Standby power was again called upon for service on July 26 because of necessary line repairs. In each instance, both units gave excellent operating performance. Total power generated in 1944 was 79,090 kwh., pumping 345,781,480 gallons of water at an average kwh. cost of .00673. During all periods of diesel operation, voltage regulation was better than that provided by purchased power. The steady voltage provided by diesel generation increased overall pump efficiency.

Toledo's Lake Erie Water Supply System was completed in 1941 as a $10,000,000 project paid for by water revenue bonds voted by the people of Toledo and by funds furnished by the Public Works Ad-

TABLE 1 — Diesel Operation 1948

	Month	*Kwh. Gen.*	*Cost per Kwh.*	*Hours Operated*
Unit #1	Jan.	18,940	.0067	39.42
	March	6,260	.0069	12.25
		25,200	.0068	51.67
Unit #2	Jan.	4,880	.0066	12.83
	Total	30,080	Average .00675	Total 64.50

TABLE II

COMPARATIVE MONTHLY PUMPAGES IN MILLION GALLONS

Month	1946	1947	1948	1949	1950	1951
January	1,317.78	1,565.62	1,599.54	1,599.89	1,515.53	1,716.99
February	1,271.32	1,428.51	1,542.38	1,463.20	1,416.50	1,547.55
March	1,396.51	1,518.07	1,622.33	1,593.78	1,609.69	1,748.75
April	1,369.86	1,459.64	1,562.61	1,563.74	1,574.54	1,712.33
May	1,430.76	1,581.67	1,690.50	1,760.34	1,818.23	1,889.96
June	1,516.43	1,630.86	1,782.87	1,994.16	1,885.21	1,958.84
July	1,782.86	1,660.01	1,931.45	2,163.06	2,058.03	2,097.42
August	1,782.86	1,919.17	1,922.40	2,016.66	2,195.63	2,083.15
September	1,647.82	1,656.92	1,734.78	1,664.28	1,884.26	1,907.95
October	1,667.60	1,613.40	1,625.28	1,655.41	1,899.63	1,864.89
November	1,495.41	1,492.48	1,551.92	1,600.50	1,748.77	1,676.77
December	1,498.07	1,574.97	1,587.07	1,633.11	1,782.77	1,730.25
TOTALS	18,154.07	19,099.32	20,153.13	20,708.13	21,488.79	21,934.84
% Increase	4.45	5.20	5.09	2.75	3.77	2.07
Min. M.G.D.	31.08	37.68	38.89	35.92	41.42	44.79
Max. M.G.D.	71.36	76.95	86.78	85.69	85.60	84.58
Ave. M.G.D.	49.74	52.33	54.84	56.73	58.87	60.09

ministration. Designed with an eye to the future, the system could easily expand for greater loads.

The intake crib, located in 22 feet of water, feeds an intake conduit 108 inches in diameter. From the Low Service Pumping Station, water is lifted and forced into a 78 inch delivery line running underground to a Chemical Building, where the water is purified by treating it with chemicals and passing it through sand filter beds. The High Service Pumping Station sends the water through smaller pipes and from these to small laterals which serve the customers. (See Table II) The Low Service Pumping Station is equipped with four pumps, three of which are directly connected to 1100 hp., 507 rpm., 2300 volt variable speed slip ring Westinghouse motors, each of which delivers 55 mgd. at 100 ft. head. The fourth pump is directly connected to a 700 hp., 508 rpm., 2300 volt, slip ring Westinghouse motor. With this type of installation, it is possible to obtain 11 operating speeds. To assure dependable performance in the event of an emergency, each of the Superior diesel standby engines is operated alternately for four hours each Wednesday. During this operation, the engine generator drives one pump while the other is driven by power supplied by the Toledo Edison Co. This is easily accomplished by opening the bus tie switch which divides the circuits.

Elevated wash water tank of Toledo's Lake Erie Water Supply System. It has a capacity of 1,000,000 gallons.

Low Service Pumping Station of Toledo's Lake Erie Water Supply System. Located on the lake shore, it houses pumps, motors, and two standby Superior diesel engine generators used to lift water from the intake conduit to a delivery line running underground to a chemical treatment building.

RAILROAD DIESELIZATION MOVES INTO ITS THIRD AND MOST PROFITABLE PHASE

Electro-Motive Division's Novel Decentralized Factory Rebuild System Forecasts Huge New Savings to U.S. Railroad Industry

By CHAS. F. A. MANN

The comparatively short time since the advent of the distillate burning 3-car Union Pacific Streamliner and original diesel 3-car Burlington Zephyr with the first 8-cylinder Model 201 Electro-Motive diesel engine, in 1934, has seen the greatest transportation revolution in world history. From the old Winton plant at Cleveland, later the Electro-Motive Corporation, then the EMD Division of General Motors, not only did a revolutionary concept of railroad motive power get its start, but the inevitable internal and external economic forces turned loose also a whole new concept of transportation within the USA and later throughout the world. Basically, a diesel locomotive has made 1 freight car now do the work of nearly 3 in the old, slow, clumsy days of 100% steam. Competitive transportation, in the race to capture a greater share of the nation's transport, in turn increased the speed and capacity of the railroads to meet the new challenge, and, like the cat-chasing-tail business, it started an endless chain reaction that has set a world pattern from which there is no turning back and the future of which is still almost breathlessly unlimited.

The first phase of diesels on railroads was experimental and largely technological and tremendously mechanical. The second phase, after mass production of standardized diesel units became an everyday fact, was largely Railroad Economics. Where to put these sleek new diesel babies to show off to Bankers, cynical Motive Power Departments, Boards of Directors and Stockholders to the best advantage. "Of course the Diesel is okay on the feature trains, both freight and passenger, but we'll naturally have to wear out the old steamers on the branches and on local runs—costly diesel will never replace all our steam." Yes, this writer has heard this same reasoning from 500 key Railroaders scattered from Portland, Maine, to railroad dead-end Vancouver, B. C. and right in the citadels of railroading at San Francisco, St. Paul and Los Angeles, for 14 of the 18 years since the Zephyr and the Streamliner.

The third phase is the sudden awakening of economists, the more educated and constructive railroad critics, both on the payrolls and in boardrooms uptown, perhaps representing unhappy owners of railroad securities, to the fact that a costly machine like a diesel locomotive can eat itself up with costly, delicate repairs if not handled properly; and, secondly, if all these brilliant profit statements from feature train operation with diesels, and the astounding savings everybody uniformly reports with diesel switchers, why not move as rapidly as possible to 100% dieselization and melt up for scrap everything connected with steam? Thus we are at the final stages of diesel evolution on U. S. railroads and are now speeding along into the final economic potentialities of 100% railroad dieselization.

The diesel locomotive manufacturer who sees the whole picture of 100% dieselization of the railroads, therefore, has had to get out and hustle up ideas and facilities and dream up a whole new concept of his own part of the business to keep his head above water. The reasoning behind it all is that as the average age of the U. S. total diesel locomotive fleet rises steadily, the total annual outlay for maintenance, repairs and modernization of the total diesel fleet on all railroads will rise steadily, therefore the greatest new, and almost unexplored field of savings with diesel, lies not in 100% concentration of replacing steam with diesel, but in heavy concentration on how to cut down repair costs and time out of service. When the country had 50 diesel freight units in service and fewer than 500 diesel switchers, all nearly new, this, in dollars and cents, was a negligible factor. But, as these figures increase ten times almost overnight, the great field of low-cost diesel locomotive operation and maintenance procedures looms as the new goal with diesels.

Making your diesel inventory pay off as fast as you can, is the goal of all U. S. railroads, whether they run the feature freights and passengers, switch in the terminals or scoot up the rocky road branches to haul trainloads of bulky, vital raw materials to the mainline. So, the third phase of railroad dieselization is upon us. The gaps toward 100% dieselization on two dozen large U. S. railroads are closing fast. Two years ago, when a railroad became 100% dieselized, it was big news.

Today, three or four lope along in the 80 and 95% brackets and they aren't much news except to complete the record, or perhaps be the occasion for a little banquet the day "Old Puffy" was sent to the boneyard and a truckload of acetylene gas moved to the backshop for final carving into blast furnace scrap.

In its third phase, with the dual problem of building toward 100% diesel motive power and reducing, wherever possible, the monthly M and O costs, two schools of railroad management thought emerge. One school, mainly confined to the larger railroads that have traditionally maintained huge central shops capable of every kind of repair and rebuilding job, as well as capable of building, brand new, every kind of rolling stock they use, merely sees the picture of converting their whole shop organization from steam to diesel, willy-nilly, and doing 100% of all of this work themselves. The other school of thought, largely confined to a few brilliant medium large systems and most of the smaller lines, believes that, like building a passenger car containing heavy doses of patented or specialized equipment, or a locomotive with heavy doses of patented or specialized accessories and features, practically all equipment used by railroads is a specialized product of specialized manufacturing. So why go out and raise huge investment capital funds to set up its own facilities for making and repairing rolling stock and motive power that can be bought or serviced cheaper from direct outside purchasing? What good will it do the railroad industry as a whole if Big Railroad A can operate a 6,000 hp. freight diesel right down to the bare lowest cost, while Connecting Line Smaller Railroad B has to build up a huge partially utilized shop organization and turns up with diesel costs three times its larger brother?

Also what good will it do the diesel industry? In the core of this wide variation in diesel maintenance and operation costs, and the exorbitantly high costs of diesel maintenance shown by some lines who refuse to abandon their steam thinking, lies the spotty unrest for insistence on development of the gas turbine, the steam turbine and the coal fired gas turbine locomotive, solely on the promise that they have something cheaper and better than diesel, which, of course, is nonsense until some Metallurgical expert evolves a gas turbine blade that will run at temperatures up to 1650 degrees, and won't pit when peppered with powdered coal dust. When he does, then build them to railroad boxcar size and weight limits, and throw the diesels out of the cabs. Meanwhile, why burn black oil in a gas turbine when half as much diesel fuel oil in a diesel will do the trick for a third less cost?

So, with the same astute foresight that landed its diesels in the first feature passenger locomotives in the middle 1930's and into the first Santa Fe freight diesel in late 1940, the Electro-Motive Division of General Motors has sized up the two-sided problems presented with phase three of this diesel railroad revolution, and, as usual, calmly dived in and landed feet first exactly where it set out to reach some years ago. Basically, EMD has seen the handwriting on the railroad wall of this business of widely varying standards of repair, maintenance and rebuilding among all the railroads using diesel. It has also sensed the direction of manufacturing policies and sales it must follow if the large, almost forgotten network of 50-60-70-85 lb. branchline railroad trackage are to be able to take full advantage of diesels. While the bigwigs dreamed up their enormous, complex new day steamers, with heavy tenders and wheel loads

Electro-Motive Factory Branch at Emeryville, California.

that will navigate safely scarcely 10% of the nation's main lines, EMD has been studying the realities of wringing profits out of running feather-light wheel loads under diesels on the long, glorious, almost unknown branchlines that go up-country for 40% of the nation's mainline traffic, and have no Chambers of Commerce or club cars to fight, and are actually the backbone of solvency for 70% of the nation's railroads. Its recent new 6-motor road switcher seems to be the final answer of wide-range, light-wheel loaded motive power to replace "Old Puffy" and the leaky wooden water tanks on the Jonesville Branch.

The biggest problem confronting railroad management today is whether to expand or contract its total shop organization. Should we convert steam to diesel shop facilities, or build brand new diesel shops and either tear down the old buildings full of coal dust and grime or convert to a new industry site? Should we abandon the idea of building any more freight cars and buy everything from car builder specialists? Should we forget having anything but running repair shops and let the manufacturer of our diesels service us with complete stock of parts and do all of our rebuilding for us? Are we to stick to transportation alone, or shall we continue being a manufacturer of transportation equipment as well as a manufacturer of transportation? Actually, in the process, railroads have been also the nation's largest manufacturer of transportation roadbed, and some of everything else, including sleeping, dining, telegraph, express, and landlord facilities.

But the old order is changing. Three fourths of the large railroad terminal cities, today face the grim reality of the fact that where once they were the big payroll of their communities, now the sum total activity of truck, bus and airline terminal payroll is generally far larger than the railroad payroll. The traditional, and historic urge to community stewardship was a powerful, wonderful method of building up the nation's strings of cities and towns. The railroads had an obligation to build community payrolls as they went, in the days when they were monopolies. But all of this is gone with the wind, for today railroads have no monopoly, and are in a bitter competitive struggle for survival. Their padded, semi-efficient shop payrolls of yesterday cannot be maintained as Civic decorations to please Chambers of Commerce people or Tourist attractions on pretty folders.

Electro-Motive Los Angeles Factory Branch.

Electro-Motive Factory Branch at Jacksonville, Fla.

Sentimental Railroad people yearn for the good old days when their shop payrolls could swing a community's loyalty or thinking, but when a shop foreman casts his near-retirement eye on 500 shiny automobiles driven down to work by his shop crew, the fast sleek diesel busses roaring past the front gate, and the airliners overhead, he cannot help but feel that the small boys who used to sneak in and watch him turn a pair of 6-ft. wheels out of "Old Number 94" aren't too worried about the payroll future of the big brick shop at the edge of town.

So, dieselizing the railroads in phase 3 has begun to change rapidly, a 100-year old railroad tradition. It is this writer's opinion that the whole process of re-indoctrination of railroad thinking from a complacent, traditional status of a monopoly, to a highly competitive superior form of transportation, was solely due to the advent of dieselization. Another $15 Billion profit for them.

As the saturation point of sales of new diesels comes on, and the probable day when the pressure on manufacturing new units lets down, the whole diesel industry will enter a highly competitive state of producing not only replacement parts and rebuilding facilities, but rebuilding service of the highest quality, at the lowest price and dished up to frantic motive power forces in the fastest possible time. Economists opine this day will probably also coincide with a depression and at a time when loose folding money is scarcer than it is now. To that end, EMD has already done a fairly comprehensive job of setting up parts warehouses at strategic points throughout the nation, at railroad terminal points where the greatest number of systems can be served in the shortest time.

During the closing days of World War II Electro-Motive recognized that there was a wide open gap in its series of services for the customer railroads. For the first time large numbers of traction motors, generators and diesel engines were coming up for complete overhaul, or "rebuilding" as the technical term has evolved in railroad diesel jargon.

Practically no railroad was equipped to take care of this job properly. As a matter of fact it was something new, there being no comparable operation in steam practice and it was the kind of thing that would not show up until diesels had worked for several years on a given railroad in some quantities. The term "rebuilding," it should be explained at this point, is not to be confused with repair and maintenance. Electro-Motive is not in the slightest degree interested in taking over the running repairs and maintenance. This, in the policy of the manufacturer, is just as much the job of the railroad shops as it ever was. But the manufacturer did recognize that someone had to establish centralized facilities for the complete rebuilding of traction motors, generators, engines and other major components (which may come up at intervals of from three to twelve years on smaller railroads) so that the needs of a number of roads could be pooled, thereby supplying sufficient volume to offset the high investment to provide the factory machinery and processes, and specially trained labor necessary to turn out the jobs with the same guarantee as new equipment. Few railroads can afford to set up such facilities and few have sufficient equipment coming up for rebuild to provide regular work for the necessary specially trained personnel.

So Electro-Motive started its system of Factory Rebuild Branches in 1946. With their strategic locations all but two of the Parts Warehouses are located at the same points. The plants have been continually expanded. A program of almost complete retooling to install later factory methods and machinery, begun two years ago, is nearly completed. The net result of this technological improvement showed up August 1, this year, when Electro-Motive announced a 30% reduction in catalogue labor prices for a traction motor armature rewind job and a flat 10% reduction in all other labor charges listed in the Factory Rebuild catalogue. This reduction amounted to $98 on the traction motor armature job. The price reduction, incidentally, came on the heels of the steel strike with its substantial increase in steel labor costs and in steel prices.

Out of the factory rebuild movement has evolved, largely at the demand of the railroads themselves, the twin types of service—the repair and return service where customer railroads simply ship the worn or damaged part to the factory where it is completely rebuilt, then returned to the customer, or, secondly, there is the unit exchange service where a customer simply orders a complete rebuilt unit or part and then ships his worn unit back in exchange, which incidentally, because stocks have been gradually built up, is by far the faster, and in most cases cheaper, avoiding the delays and time lost in a round trip to the factory.

Locating these branch factories and parts warehouses follows a unique pattern by the very cities selected for sites. The whole 1950 diesel railroad pattern, far different from the old steam pattern, can be gleaned from the listing of the cities selected. Every U. S. railroad is overnight or, across the street from an EMD plant now, and the sagacious location of the main EMD factory at La Grange 15 years ago itself lends perfectly to the greatest mainline concentration on the continent at Chicago. EMD's great La Grange works could, in a depression, maintain a huge activity on maintenance and repairs alone, if conditions demanded, because of its strategic location in the heart of the U. S. railroad world.

Two other features comprise the full factory rebuild service of EMD. At La Grange the company now provides a portion of the great manufacturing plant which is set aside as though it were a separate branch factory located in a separate city, for the rebuilding of collision damaged locomotives and for the conversion of older models into modern units. Locomotive conversion provides that any model built in any year by EMD, can be sent back to La Grange and modernized with practically every new development or part that has been developed since the day the unit first left the factory. Not only can the older units be modernized, but they can be converted to the newer types, or in some instances, can be modified into other types, whichever the customer desires. Damaged EMD diesels can be brought in, stripped down, rebuilt and modernized to whatever degree the customer wants, and returned ready for the road. All this fatory rebuild service has its own personnel organization operating as a part of the sales department, and its own field forces working constantly with the shop and operation organizations of the customer railroads. This organization devotes its full time and full thinking to rebuilding of diesels already built and sold, and thinks of nothing else but getting the older diesel war horses to show constantly lowered maintenance costs per hour or gross ton mile.

Location of the factory branches gives customer railroads rapid service. On the Pacific Coast, at Emeryville, Calif., convenient to Oakland and San Francisco, a 2-acre site on the Southern Pacific

has a 75x400 ft. building with large shop to serve the Bay lines. Four hundred miles south at Los Angeles, a much larger shop, 200x300 on a 4-acre site, serves the busy southern lines terminals, and is served by the Los Angeles Junction Railroad. This is the most complete of the two Pacific Coast shops and handles everything down to heavy diesel machine work. Largest and newest of the factory branch plants is at Robertson, Missouri, 17 miles out of St. Louis. It is located on a 7-acre site and the main building is 150 overall, and is equipped to handle a heavy volume of work for 21 customer railroads. It is served by the Wabash Railroad. Heavy machine work on diesel engines is being developed here, so that most of the program can be done in this plant instead of at La Grange.

On the Atlantic Coast, the Halethorp, Md. plant, located 9 miles outside of Baltimore, carries the load for the North Atlantic lines, and is served by B & O Railroad. It is a modern brick structure 150x420 ft. located on a 5-acre tract. Because of the great shop activity on the Pennsylvania and B & O the emphasis here, at present, is on speedy handling of parts and unit exchange transactions. The south Atlantic Coast is served from a 96x320 ft. plant at Jacksonville, Fla. which in turn is served by the Atlantic Coast Line. Here the lines serving the South all converge conveniently to permit parts service for a radius of 800 miles fanwise, from New Orleans to Richmond, Va.

At La Grange a larger factory branch is located as part of the headquarters plant, plus facilities for collision rebuild and locomotive conversion. In addition to the factory branch plants, where actual manufacturing-type machine work is done, branch warehouses for speedy handling of unit exchange and repair and return booking are set up at Minneapolis, served by the Soo Line, and at Fort Worth, served by the St. Louis and San Francisco. Thus a nation-wide network of strategically located parts and rebuild facilities are provided for fast economical parts service, reducing the customer railroads investment in stocks of parts and costly organizations and facilities to rebuild.

The countless innovations devised by EMD in handling its service and in getting its messages across to the customers, springing from its missionary days when people looked at diesels as nice, but "maybe tomorrow," have become fixed legends in U. S. railroading. It blandly issues a loose leaf catalog with hundreds of prices listed, like a housewife finds on Spam and cheese spread at the local super market, ranging from an axle cap bolt and washer assembly listing at $1.54 net, right up to a strip and rewind job on D12 and D14 generators listed at $3,537.24 net. Pioneer steam locomotive builders would fry to a crisp if they saw a price catalog on repair jobs like this!

Their whole approach to the maintenance and operation problems of the American railroad industry is a good tonic for every railroader motive power man. Right now, every railroad shop and operating man is trying his level best to beat EMD's costs to a draw, and prove to his president that he can do it cheaper and better than EMD. The first time in over 90 years when operating costs

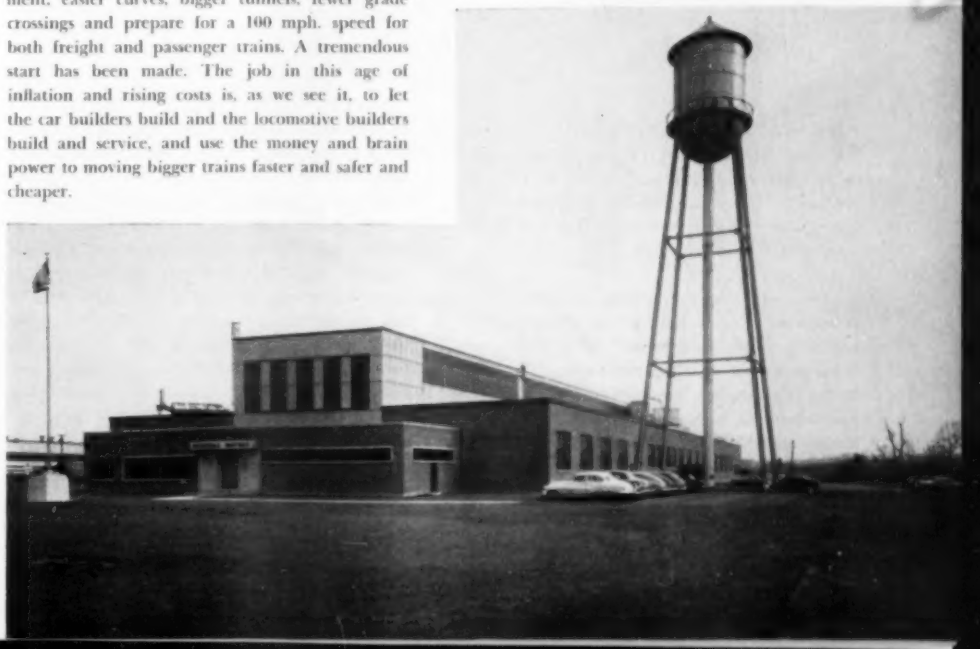
Electro-Motive Factory Branch at Robertson, Mo.

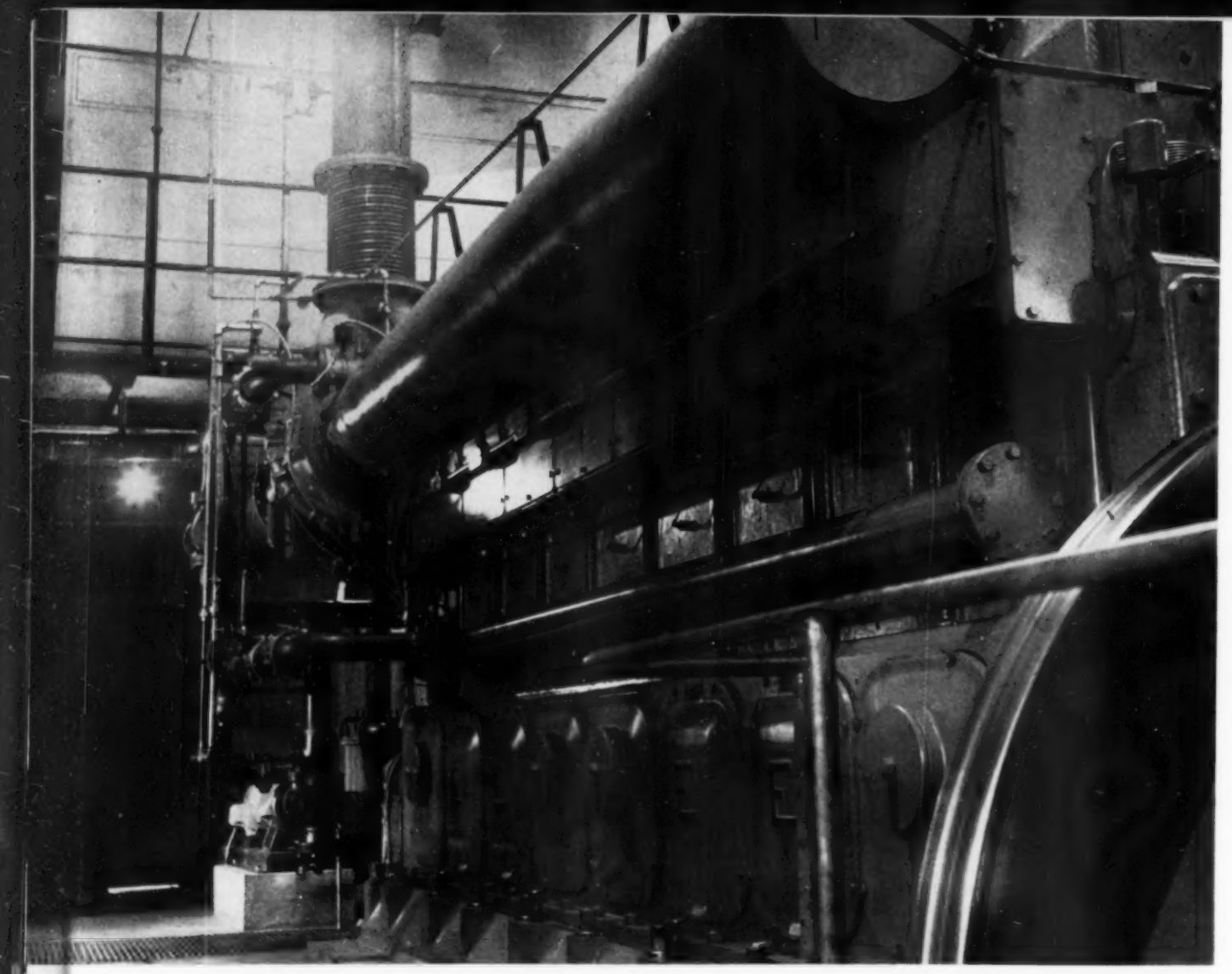
ever faced a competitive race from the outside—like having a local garage man bid on welding a rod on an old steamer! The fast moving pace of railroad diesel is swiftly changing the old order. As of this writing, it looks like the traditional approach to Railroad Mechanical problems and shop practices must inevitably give way to the specialist who serves even his hated competitor. The home mechanic and the village blacksmith each too had their part to play in evolution of the American Machine Age. But each gave way to the downtown garage; the lawnmower and appliance repair specialist.

So, too, it now looks like the railroad industry must convert every square foot of its idle buildings and land into revenue producing, and traffic-generating income, cut out the frills, and turn its back on the old ideas of community stewardship and monopoly and individual concepts of car-building and locomotive building. Their job is to turn all their cash to new and modern equipment, easier curves, bigger tunnels, fewer grade crossings and prepare for a 100 mph. speed for both freight and passenger trains. A tremendous start has been made. The job in this age of inflation and rising costs is, as we see it, to let the car builders build and the locomotive builders build and service, and use the money and brain power to moving bigger trains faster and safer and cheaper.

The Electro-Motive approach is today's best answer. Those who don't understand it or don't try to copy it, will not be in business by 1965. The next Electro-Motive factory branch will be constructed at Salt Lake City next year. This plant and parts warehouse will serve the Rocky Mountain and Pacific Northwest territory, as well as the east end of the long U. P. and S. P. lines from San Francisco, Los Angeles, Portland, and the Western Pacific, and the Rio Grande and Union Pacific Mainlines east. Tomorrow's great new field of savings with diesels lies in chopping down the repair and maintenance average cost per unit. It is estimated that even with the present 11,000 unit diesel fleet, savings totalling $100,000 per day can be achieved by cutting repair costs of the highest down to 10% below the average of all—a relatively easy goal to achieve with the EMD philosophy and system which has paved the way for the benefit of all railroads.

Electro-Motive Factory Branch at Halethorpe, Md.





JUNEAU, ALASKA

By JAMES JOSEPH

JUNEAU'S Alaska Electric Light and Power Co., long drawing its power from hydro sources, has recently installed the first of two Enterprise diesel engines. The word "dependability" looms large in this switchover from traditional water sources to dieselization.

To the casual observer, Juneau is one town that, power-wise, seems to have all the hydro power it needs. A visitor is impressed by the seemingly limitless sources of hydro surrounding the town. Rising from Juneau backyards are the mountains. And behind them are glaciers, including the famed Taku glacier. And back of these, clear into British Columbia, rise the Coast Mountains whose altitudes average about 8000 feet. All these potential hydro sources, and their latent power, drain toward the island-splotched Alaskan coast, which is also Juneau's townsite. But when you talk with power engineers in the Alaskan panhandle, you get an entirely different story. "Lots of potential hydro power," they concede, "only what do you do when it freezes solid in winter?" Which only goes to prove how wrong a casual observer can be. Besides this, the electric load growth has increased about 15 percent a year during the past 5 years. And Juneau's population (5,818 in 1950) while not leaping ahead as is Anchorage's, is nevertheless increasing. Five years ago the average home entrance switch in Juneau was rate 30 amps; today, it's more likely to average 100 amps. People are simply using more electrical appliances. With this power squeeze, Alaska Electric Light and Power Co., which serves the Juneau area, looked to its sources of electricity. It had long drawn power from two Alaska Juneau Gold Mining Co. sources: from a plant at the Treadwell mine and from the hydro installation on Annex Creek, which took energy from the Taku river. This plant sent its output to Alaska Electric Light and Power Co.'s Juneau distribution points via a 3½-mile line.

Poles for this line are 3-ft. in diameter, and have cross-arms and supports almost as large—but Alaska's icy winters still snap them like match sticks. So even these sources which supplied an approximate 50,000-60,000 kva. monthly weren't always dependable. It was nobody's fault—except

the weather's. Alaska Electric Light and Power Co. had another power source—its own three hydro generators housed in its Juneau plant, which drew water via a quarter-mile long flume from Gold Creek, which runs practically through town. These hydro generators are capable of producing 1000, 900 and 1200 kva. respectively. Only trouble is, Gold Creek freezes nearly solid from fall freeze-up until spring thaw. So this source, at best, was good only during the summer. Another water source, Salmon Creek, has a perennial shortage, due mostly to freezing weather.

Maintenance costs were also factors. For example, learned while in Juneau that the relatively short power line from Annex Creek, a distance of about 3½ miles, cost 1½ times as much to maintain during its first operational year as was expended in the initial building. The three-wire line was carried on steel and log poles. And even though this line was encased in steel, it sometimes iced up until 3 or 4 feet of ice coated it. Sounds improbable?

Maybe so, but it's a fact. So bad was icing that electrical engineers had the habit of shorting the ends of the line after midnight, when the load decreased. The resultant heat generated through the inherent resistance of the wire melted off the ice! There was another problem, too. Low-hanging lines in some steep, isolated spots all but touched the ground. When four or five feet of snow piled up, the line was covered completely. Tunnels 4 to 6-feet in diameter formed around these wires, since their resistance created heat which in turn thawed the surrounding snow. As one power man explained, "these snow-made tunnels which formed around buried power lines were real freaks. They became a kind of natural flue through which we actually recorded wind velocities up to 70 mph."

At one time there had been the possibility that Gold Creek, even though it flowed only in summer, could be developed into a more dependable power source by building flumes still higher up its course. But Territorial Law, which grants prior water rights to the mining companies, ruled this out. Even though most of the mines around Juneau are shut down, this right still is in effect. So, with its load steadily increasing by about 15 percent a year, and with commitments to supply a small REA project at Auk Bay with electricity for summer homes and for a few dairies, it was natural that the power company should turn to diesels.

On Feb. 6, 1952, the first Enterprise diesel engine, housed in the company's Juneau hydro-plant, went into operation. The Enterprise had been shipped by boat from Seattle. The engine is a Model DSQ-318, 8 cylinder, with 16-inch bore, 20-inch stroke, and rated 1700 hp. at 360 rpm. Maximum exhaust temperature is 880 degrees F. The Enterprise drives an Elliott ac. generator, rated 1550 kva., 1240 kw. at 360 rpm., with 3-phase, 60 cycle output. There's also an Elliott dc. exciter, 20 kw. at 1750 rpm., with an output of 125 volts and 160 amps. The Enterprise is installed with an Elliott-Buchi Turbocharger, with self-contained lubricating system. The governor is a Woodward UG-8, and Cuno Auto-Klean Filters are part of the installation.

There are several interesting features to the Alaska Electric Light and Power Co. diesel installation. For instance, there's the evaporative cooling system. Engine cooling water exits via three. #14 gauge galvanized ducts, all 2 ft. 4-in. diameter, which carry water to outdoor evaporators. The cooling water cools lube oil at the same time. There is no outdoor silencer. Instead, the Kittell exhaust silencer is installed on the engine exhaust, with the silencer portion inside the building, the exhaust outside. This apparently is to prevent the silencer from icing up during the winter. The control panel carries indicators not only for the diesel engine, but also for the three hydro units, and has space for addition of indicators for a second diesel. A 500-gallon house tank pumps fuel to the engines, and does not use the gravity feed method. At one time the power company operated a steam plant, which was first fueled by coal, and later by oil. Thus it already had storage tanks, although these are now leased to Standard Oil of Calif. So instead of having fuel oil and lube oil storage adjacent to the plant, these necessities are brought via pipeline from these storage tanks on Juneau's waterfront. Straight diesel fuel is shipped by tanker from Seattle and costs about 14-cents a gallon delivered.

The company's heaviest load is during the summertime, when construction and fishing industries are working overtime, so the summer load is balanced by three existing Pelton hydraulic turbines. One of these Pelton units (developing 800 kw.) drives a 3-phase, 1000 rpm. GE ac. generator. The other two, both identical, produce 400 kw. respectively, and drive Westinghouse, 3-phase, 360 rpm. ac. generators. There is still room in the power house for the second Enterprise. The base for this unit was laid at the same time the first diesel was installed, and delivery of the second unit is expected soon. Franz D. Nagel is plant superintendent. Operators are Harry Lea, Ernest Gillian, Fred S. Alexander and Hal Windsor.

List of Equipment

Cooling water circulation pump—Woodin and Little Co.
Lube oil cooler—Thermxchanger Corp.
Lube oil filter—Honan-Crane Corp.
Engine control panel—Columbia Electric Mfg. Co.
Intake air filter—Air-Maze Corp.
Exhaust silencer—Kittell.

DESERT DIESELS STRETCH IRRIGATION WATER

By F. HAL HIGGINS

DIESELS are doing something about the weather in Arizona. The precious water supply has been the big problem in holding back further development of farming and industrial expansion in Arizona in the face of both winter tourist and permanent settler demands that have boosted its population second only to California in percentage of gain. The hot dry climate and arid soils do a double vanishing act on irrigation water once it gets out on the ground and into the canals and ditches. It has always been a slow and costly process to line irrigation ditches and canals. So most of the new farm lands that have come into production in the pre-war years and up to recently had been of the wasteful unlined type. But two or three years ago a young fellow by the name of "Bud" Fuller solved the problem of movable form concreting with motor truck mixers emptying into the canal form as it was pulled down the ditch by a tractor as the trucks moved along the bank of the ditch. "Fuller-form," he called it. The idea has grown by leaps and bounds until it is now an industry that keeps a big aggregate plant with a fleet of diesel trucks busy all the time.

A perusal of Arizona's statistics brought up to Sept., 1951, by the Valley National Bank of Phoenix is interesting in showing the rush to save and stretch the limited water supplies. Between 1900 and 1950, Arizona's population multiplied by 6-plus. It gained 50.1% between 1940 and 1950 census takings, which ranked it right up No. 2 next to California in national gain for the decade. In population growth since 1900, again it ranked next to California with 510% to the Coast State's 613%. But in farm income growth, Arizona topped all in percentage of growth in the past decade with a 419%, or a cash boost from $190,000,000 to $766,000,000. All that held the copper state down to this measly figure was that most precious natural resource—WATER! And with tourists spending an annual $100,000,000 in Arizona, much of this farm production is consumed at home instead of being hauled over mountains and desert to industrial

Diesel train: Diesel tractor pulling V-concreting form in ditch as it also helps GM diesel truck work alongside the ditch as it unloads its concrete from the truck mixer on the truck. Note string of GM diesel trucks coming up to take over as fast as the front truck empties and gets out of the way.

Three of the GM diesel-powered trucks at work on the line, the one in center pulling away after emptying its load into the ditch form as it was pulled along by a big Cat diesel D8; the front truck is caught in the cat, and the rear one is coming up ready to take over when the front truck is empty. Thus the fleet of seven keeps the concrete flowing as they line 150 feet of ditch at a trip.

areas on both West and East coasts. The breakdown of agricultural income was $186,000,000 for farm crops and $90,000,000 from live stock and animal products. Cotton has long been the big gainer the past four years, more than multiplying by three. Arizona's long staple cotton is famous and leads the western world in quality and price. The tire manufacturers have given the Arizona long staple cotton plenty of attention and a premium price to make it a big item in that field. This year of 1952 again sees Arizona's cotton in a top rating as to quality, but there is more water to insure more acres and a sound long-pull future regardless of what the rest of the cotton world does.

Superior Sand & Gravel Company, Phoenix, is the aggregate organization that has equipped itself with a fleet of GM diesel concrete mixer trucks to render the service from their plant to the jobs in the Salt River Valley to meet the irrigated farm demands for the new style concrete lined irrigation ditches and canals. The Fullerform system was worked out by young Fuller with the aid of John F. Morgan. The ditch is shaped in advance of the concreting, of course, and that called for some special shaping with a V-style plow with long mouldboards that lift the desert-baked soil out of the V-ditch formed as it is pulled along by the big diesel crawler tractor. All operations from the land levelling by a big Le Tourneau scraper pulled by a D7 tractor to shaping the ditch banks by dieselized blade grader and the plowing the ditch itself by the special ditcher plow are diesel. The same big D7 tractor pulls the Fullerform as the truck mixers dump into it as they move along. Each mixer brings 6 yards of wet concrete and lines about 150 feet of ditch. The size of ditch may vary, the 19, 20 and 26-inch depths being general at the start of the job last year. Young Fuller found his idea was so good that irrigated farming areas in Texas, California's Imperial Valley as well as the Salt River and Casa Grande valleys of Arizona all started using the "Fullerform" machine to speed the "water stretching" in irrigated areas last year.

This outfit seen early in May, 1952, finds the Texas Company distributor in Phoenix serving the Superior Sand & Gravel Co. with Marfak and Texaco Ursa Oil P-30 on its Cedar Rapids jaw crusher and a pair of 4-inch Symons Cone crushers as they are

Texas Company truck delivering the greases and oils to the aggregate plant of the Superior Sand & Gravel Co. to serve the breakers. Their fleet of GM diesel trucks with mixers mounted on them loads up here and mixes the concrete as they proceed to the irrigation ditches being lined.

kept busy batching, mixing and loading a fleet of 7 GM diesel cab-over-engine truck mixers that move the concrete to the ditches and mix and pour the fresh concrete into the fresh-made irrigation canals to give them the big stretch to make the water cover more acres.

On the job in this field seen on the day the writer stopped off at Phoenix to be guided by Texaco men, a Buda engine was noted in one corner of the field where it was set on a concrete base for pumping. It's job will be to continue pumping water for the new lined canals in this field, but it should have an easier task this year with lined concrete canals and more water available from the winter snows in the mountains to the north. In the fleet of trucks, the GM diesel engines that power the 7 diesel trucks are busy on their accurately scheduled runs from headquarters aggregate plant in Phoenix to the job 10 miles away. Now that the irrigation canal lining industry is set up for mass production the plant can handle any order from farm or land development interests within 50 to 60 miles. More diesel truck mixers can be added as needed. The sturdy diesels can cover highway and field travel on schedules that reduce cost to practical figures.

The faithful Buda diesel that pumps water for this Arizona farm, now getting a concrete lining for its arteries to make the precious water stretch over the acres of cotton, vegetables and fruit, is idle while the irrigation canals are being concreted.

COMMERCE, TEXAS

One 1200 hp. Nordberg Produces a Kilowatt Hour For a Total Fuel Cost of 2.70 Mills, Saves Texas Municipal Plant $11,000 in 6 Months

By W. T. WHITE*

One 1200 hp Nordberg duafuel engine in the Commerce, Texas municipal power plant is producing electric power for a total fuel cost of just 2.70 mills. This represents a reduction of more than 72 per cent in fuel costs, a saving of more than $11,000.00 in the first six months of duafuel operation.

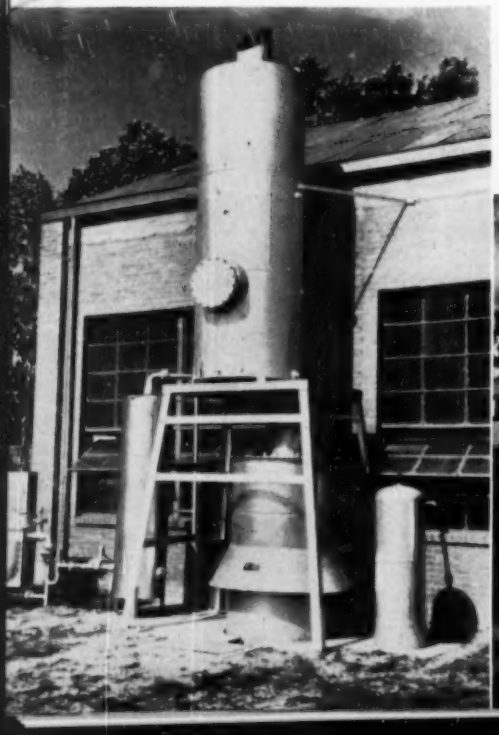
Commerce is an attractive city of 6,000 population about 70 miles northwest of Dallas. It is the home of East Texas State Teachers College with an enrollment of 2,500, a division point on the Cotton-belt Railroad, and a center for small industry such as a cotton textile plant and two garment factories. The city first constructed a municipal power plant in 1929 primarily to cut the cost of power for its motor-driven deep well pumps, for street lighting and other municipal uses. There was some excess generating capacity at the plant and this was utilized to supply a limited number of private customers. The plant paid a double dividend to the community, first in reduced taxes permitted by lower power costs for the water and street departments, second in a lower electric rate schedule for the entire community since the power company cut rates to match the lower schedule set by the municipal plant. First prime movers in the plant were three Fairbanks-Morse diesels, two rated at 240 hp and one at 180 hp. Through the years, the city expanded its own use of power and also took over a larger share of the residential, commercial and industrial load. In 1939, a 300 hp F-M diesel was added to the plant. In 1947, a Model 33 F-M diesel rated at 575 hp was installed. By 1950, the city plant, still operating in competition with the power company, was carrying fully 60 per cent of the load.

*Superintendent of Utilities.

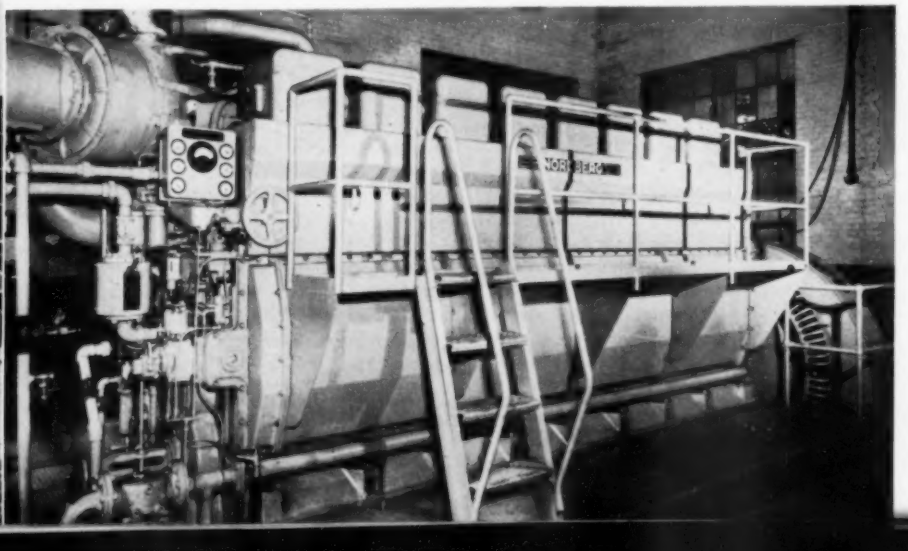
It became apparent that the existing engines would have difficulty handling the heavy load anticipated for the summer of 1951 when increased use of air conditioning and general load expansion were expected to bring record peaks. A second important consideration was the relatively high cost of power production with oil-burning engines. It was calculated that fuel costs averaged 10 mills per kwh. To provide the additional capacity required and at the same time to take maximum advantage of available low cost natural gas, Mayor A. C. Ferguson, Commissioner of Utilities Ben Johnson, and myself as Superintendent of Utilities decided it would be best to purchase a duafuel engine large enough to carry the bulk of the load. Implementing this decision, the city installed in April 1951 a Model FSG-138-SC Nordberg supercharged duafuel engine. This eight cylinder unit has a 13-in. bore and 16½-in. stroke and develops its rated 1200 hp. at 450 rpm. The engine operates on natural gas with a small quantity of pilot oil to initiate combustion. The unit drives directly a 1063 kva., 850 kw., .8 pf., 3 phase, 60 cycle, 4160/2400 volt generator with 15 kw. chain-driven exciter.

The new engine quickly demonstrated its value to the plant. Going into full service in May, 1951, the duafuel unit generated 1,510,100 kwh in its first six months of operation. This represented more than 75 per cent of the plant's total generation of 1,968,600 kwh. In this period, the Nordberg engine ran 3,637 hours, more than 82 per cent of the elapsed time. After the first two months, the unit really hit its stride and was in operation 95 per cent of the time, producing a comparable percentage of plant output. This heavy schedule inevitably meant many hours of operation with light, unfavorable loads. Average operating load factor for the engine was only 50 per cent. Yet, it proved highly profitable to run the duafuel engine even at relatively inefficient load levels rather than use the oil-burning engines. During the six months under consideration, the entire plant used 55,289 gal. of fuel oil and 9,439,000 cu. ft. of natural gas at a total cost of $8,510.40. Fuel costs for the same number of kwh. at the consumption rate prior to installation of the duafuel would have been $19,686.00, a saving of $11,175.60. The duafuel unit, running at an average 50 per cent load, produced its 1,510,100 kwh. on 9,439 gal. of pilot oil and 19,688 mcf. of gas, an average of 13.0 cu. ft. of gas and 0.0062 gal. of fuel oil per kwh. Here is the cost picture:

	Fuel Cost	Cost per kwh
Natural gas	$3,180.08	2.11 mills
Pilot oil	893.71	0.59 mills
Totals	$4,073.79	2.70 mills



This view shows the American Cycoil air filter, the Maxim exhaust silencer, the Emco gas meter and the Fisher pressure regulator.



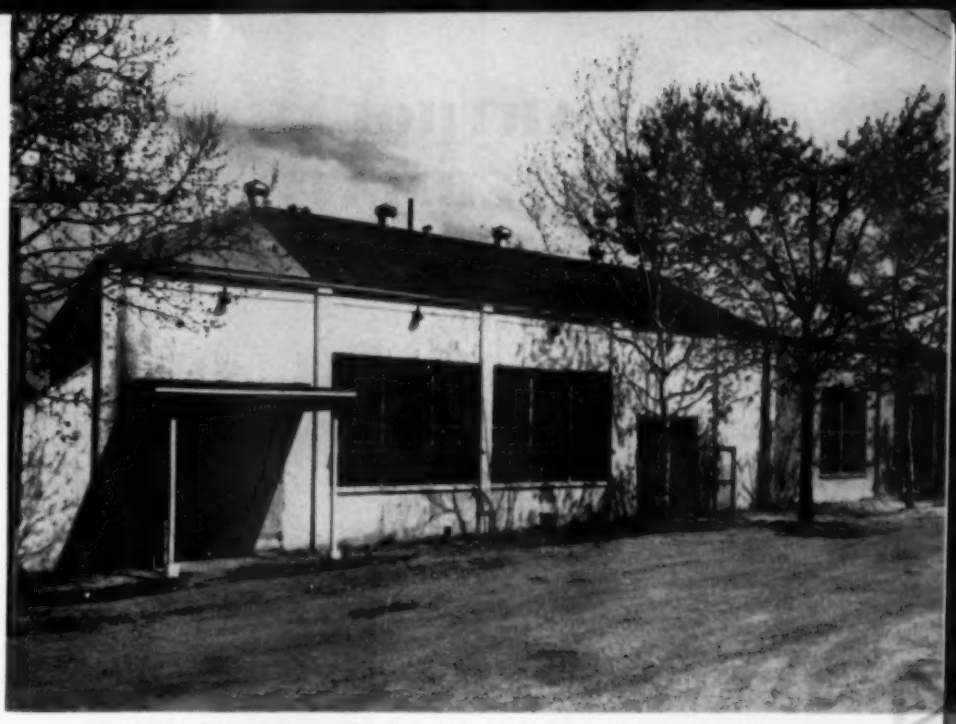
This view of the eight cylinder, 1200 hp. Nordberg Duafuel shows the gauge board with Almor pyrometer, the Elliott supercharger and General Electric generator.

Compared with the 1950 average of 10 mills per kwh., this means a saving of 7.26 mills per kwh., an impressive 72 per cent cost reduction.

Natural gas with a higher heating value of 1060 Btu. per cu. ft. at 60 deg. F. (net heat value of 985 Btu.) is purchased at a rate of 19 cents per mcf. for the first million cu. ft. and 16 cents per mcf. for the balance. The gas normally reaches the plant at 25 psi. and passes through a meter and pressure regulator, finally going to the engine at 15 psi. In practice, pressure at the incoming line has fluctuated considerably and I have increased the quantity of pilot fuel above the usual setting in order to insure good ignition. If gas pressure drops to 8 psi. the engine automatically cuts off the gas and switches wholly to oil. The fuel oil, which costs 9.5 cents a gal., is delivered by truck and stored in two 11,000 gal. tanks. A motor-driven transfer pump sends the fuel through a meter to a 300 gal. day tank at floor level in the engine room. The engine's own supply pump picks up fuel from the day tank and puts it through a duplex filter to the injection pumps. The engine shuts down automatically if pilot oil or lubricating oil pressure fails. After six months of service, the engine is perfectly clean and the lubricating oil is in perfect condition. Lubricating oil has been exceedingly low. The detergent-type oil is circulated under pressure to lubricate bearings and cylinders and to cool the pistons by a built-in, engine-driven pump. Included in the circuit is an oil cooler with a thermostatically-operated bypass valve. Part of the oil is drawn from the pressure system through a multi-element filter with disposable cellulose cartridges.

The Nordberg engine is tied in with the plant's existing raw water system but has its own closed jacket-water circuit. Soft water is circulated by a motor-driven centrifugal pump through the engine jackets and through a shell-and-tube heat exchanger with a bypass valve which automatically keeps engine water at the desired temperature. Raw water is put through the exchanger and the jackets of the other engines by three motor-driven centrifugals and is cooled in an atmospheric-type cooling tower. Soft city water is used for makeup. Air for this supercharged engine is drawn through an oil bath filter outside the plant and is supplied to the intake header by the exhaust-driven turbocharger. The exhaust gases pass through the turbocharger and out through a vertical silencer outside the plant. A compact panel mounted on the engine holds pressure and temperature gauges and a multi-point exhaust pyrometer. There are alarms for lubricating oil and jacket water pressures and temperatures.

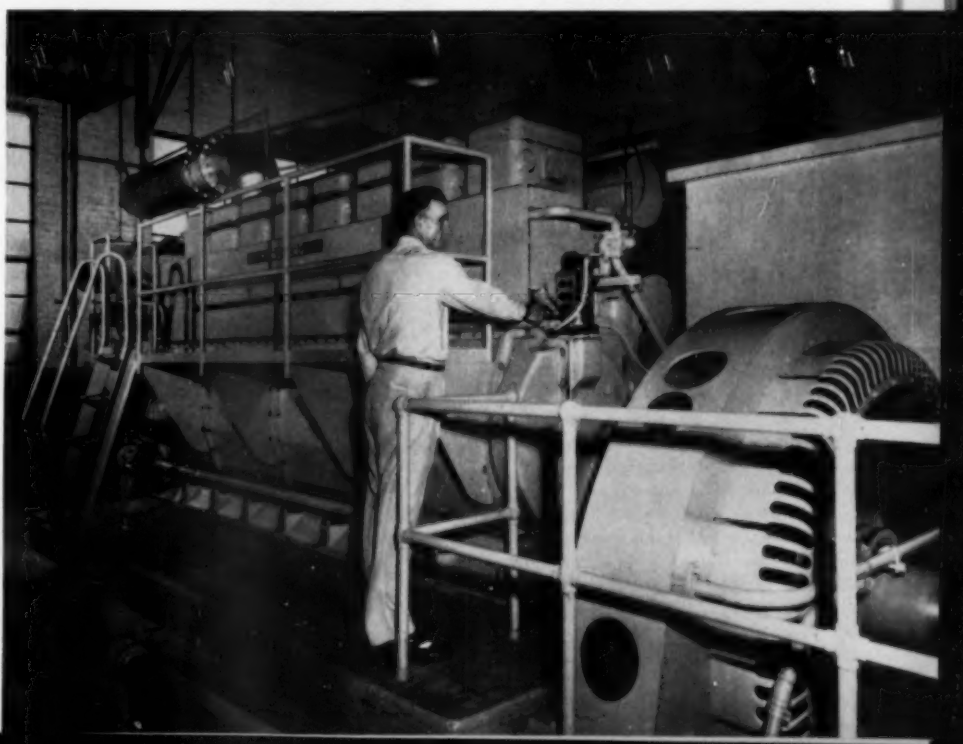
This is an expanding plant with an expanding load. In 1950, August showed the largest production with an output of 278,500 kwh. In August, 1951, production soared to 433,700 kwh. May through October in 1950 showed a total of 1,514,300 kwh. compared to 1,968,600 kwh. in the same six months of 1951. This expansion trend promises heavier, more efficient loads for the duafuel engine with resultant improvements in fuel economy. Already, duafuel economy has made an impressive showing in Commerce. The prospects are for even greater savings.



The municipal power plant supplies all power for the Commerce city departments and about 60 per cent of the residential, commercial and industrial demand.

List of Equipment

Engine—One 1200 hp., eight cylinder, 13x16½ 450 rpm., FSG-138-SC, four-cycle, supercharged Duafuel engine. Nordberg.
Generator—1063 kva., 850 kw., .8 pf., three phase, 60 cycle, 4160/2400 volt generator with 15 kw. exciter. General Electric.
Governor—Woodward.
Lubricating oil—Texaco Ursa P30. The Texas Co.
Lube filter—Hilliard.
Oil cooler—Ross.
Thermostatic controls—Fulton Sylphon.
Gas meter—Emco. Rockwell Mfg. Co.
Pressure regulator—Fisher Governor.
Fuel oil—American Liberty Oil Co.
Transfer pump—Roper.
Fuel meter—Neptune.
Fuel filter—Nugent.
Injection pumps—Scintilla.
Jacket water pump—Weinman.
Heat Exchanger—Ross.
Air filter—American Cycoil.
Turbo-charger—Elliott.
Exhaust silencer—Maxim.
Exhaust pyrometer—Alnor.
Alarm panel—Viking.



This 1200 hp. Nordberg Duafuel engine saved the city $11,000 in fuel costs in its first six months of operation. Your author at the engine. Visible in this view are the Woodward Governor, General Electric generator and Zallea exhaust joint.

AN EARTHQUAKE'S AFTERMATH

By JAMES JOSEPH

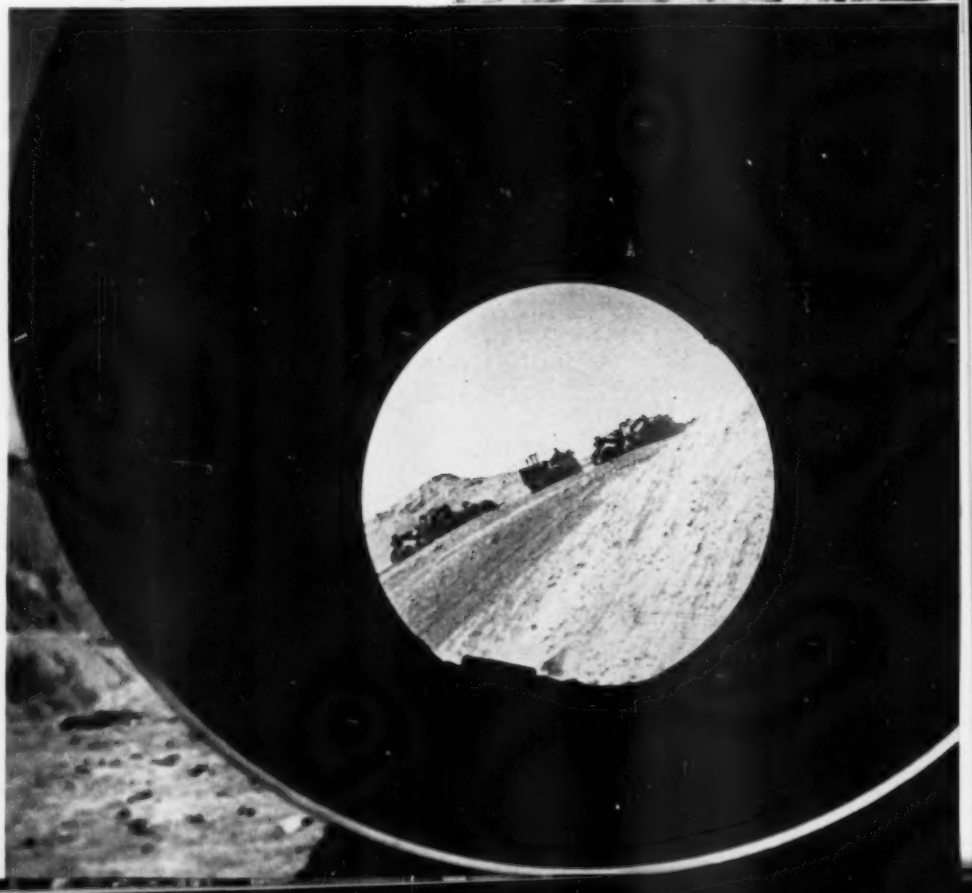
NEAR Bear Mountain, Calif.—You and I are standing here, near the epicenter of the second most intense earthquake in recent California history, watching what is probably the most heroic diesel job ever undertaken in so confined an area. Above the roar of 80 dozer engines, some 170 pieces of equipment are working—cut and filling a shoo-fly around quake-damaged Tunnel #5, one of four badly wrecked tunnels through which the main San Joaquin Valley line of the Southern Pacific railroad runs between Los Angeles and San Francisco.

In the predawn hours of July 21, the 50-mile long fault along the base of Bear Mountain, some 35 miles east of Bakersfield, Calif., in the San Joaquin valley, rocked and split open for 50-90 seconds. The quake all but leveled nearby Tehachapi, killing 14. Two hours after the main temblor, and while this faulted area was still rocking with aftershocks, Southern Pacific crewmen were inspecting the line's tunnels. By mid-morning, July 21, the call went out to Morrison-Knudsen Construction Co. Immediately M-K's best construction experts left by plane from Los Angeles and San Francisco, some coming from as far as New Mexico. As telephone lines crackled, diesel equipment contractors were summoned for the emergency. There was no talk of contracts; no time to plan long-range construction reports or to stage extensive surveys. No one knew how badly the tunnels above Bakersfield were damaged, but preliminary reports showed that Tunnels 3, 4, 5 and 6 were hardest hit. By noon, some equipment had arrived.

Now we are standing at the repair site—watching as $3,500,000 worth of diesel mechanization rumbles 20-hours a day on two shifts, 7-days a week, cutting down the mountain near tunnel #5, and filling 243,000 cu. yds., bringing a by-pass up to grade so that tracks can be laid and traffic again routed over this main line. The cut and filling in front of us is by-passing tunnel #5, which will be repaired at a later date. The fill will be 450-ft. wide at its base, 50-ft. wide at the top, and 132-ft. high. The 243,000 cu. yds. is only an estimate. Neither Morrison-Knudsen engineers nor Southern Pacific's have had time to calculate actual yardages. As one Southern California construction engineer says, as we watch the mighty dieselized "ants" blade-to-blade on the hill, "There's never been anything like this in construction history. And never anything like the coordination of men and equipment. It's the most beautiful show on earth!" He went further, said it was a prime example of American free enterprise doing the impossible job. "Southern Pacific handed the job to Morrison-Knudsen the day of the quake. We simply told them to do a job. We didn't even know for sure at the time how big a job it would be. There was no hesitation. Diesel equipment and men with know-how hit the road. Men and machinery concentrated on this spot, deep in the low-lying, but rugged, Tehachapi mountains. For 21 straight days now, more than 1000 men and up to 170 pieces of diesel equipment and implements have been working."

It will take months, after the job is finished, before a completely accurate tabulation is made of the equipment and men on the job. That will be left to construction historians. Right now—in the churning mass of diesel machinery gouging and carrying—there are dozers belonging to at least

Two men go to work lubing a carryall. Six men, working simultaneously on each diesel rig and carryall, got unit back onto job in less than three minutes.



Parade of dieselized equipment as seen through one of the huge drain pipes used on the re-building of the Southern Pacific Line.

eight contractors besides M-K. Lee Boyd Construction Co., Bakersfield, has 12 dozers on the line; H. Earl Parker Co., Marysville, Calif., has 29 rigs; Paul Moe Construction Co., El Monte, Calif., has a couple of dozers and carryalls; Vinnell Co., Inc., Alhambra, Calif., has 9 rigs plus Woolridge (18 cu. yd.) and Gar Wood (14 cu. yd.) carryalls. Vinnell is also running a couple of Caterpillar D-8s, the new "souped-up" twin-piped, shaved-headed jobs with increaesd horsepower; Los Angeles' L. A. and R. S. Crow Co. is on the job with five rigs; Miller-Henkel Construction Co., Fresno, Calif., has three dozers; Griffith Co., Los Angeles, is here with its equipment, as is Rexroth and Rexroth, the Bakersfield contractor who was first at the scene. Allis-Chalmers and Internationals make up about 50 per cent of the dozers, with Caterpillar accounting for roughly the other 50 per cent. Shepherd Tractor & Equipment Co. and Shaw Sales & Service Co. were two of the diesel maintenance services on the job.

The main quake damage occurred on a wide curve. On the Bakersfield end were two tunnels, #3 and #4. Tunnel #4 has been daylighted—its top uncovered by dozers and its reinforced concrete (23-inches thick) broken and dirt scooped in. This tunnel and its buttresses will become a retainer

Endless stream of equipment working on shoo-fly around tunnel #3 which is cut through mountain, to right, out of camera's view. Twenty-eight rigs can be seen in this photo alone.

This is what quake did to rails. In background is partly daylighted tunnel #3. Dozers cut away mountain to open this tunnel.

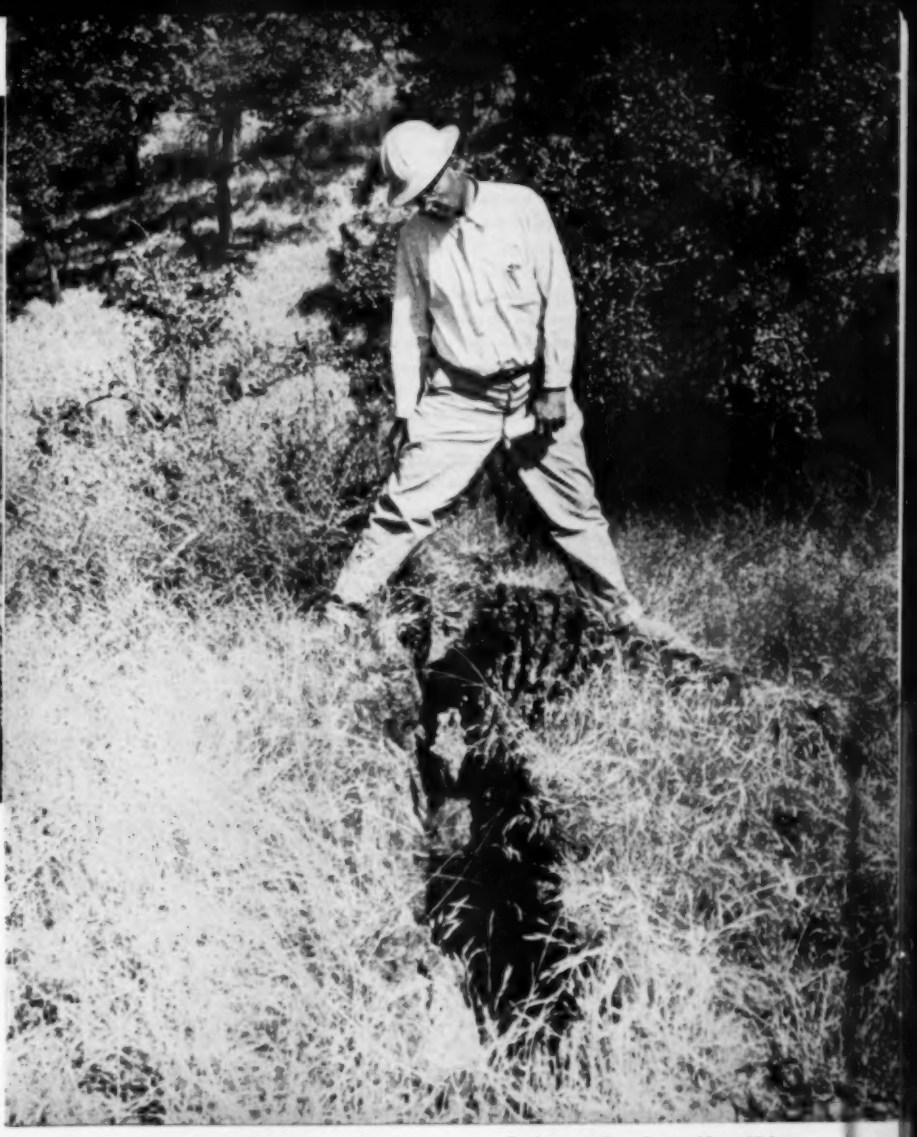
A fleet of D8 tractors worked two 10-hour shifts daily to repair Southern Pacific Railroad tunnel damage after the July 21 earthquake in California.

wall for the track which will run alongside it on a short shoo-fly. Tunnel #4 was 334-ft. long, and was split by an earth-crack several feet wide. However, a main crack snaked through tunnel #3, which is 700-ft. long. Two hundred and six feet, at the tunnel's east end, have been daylighted by dozers which cut down the mountain side about 147-feet to expose this damaged section and to remove it. The next tunnel in line, #5, is the most badly damaged—and around this is being built the long temporary, shoo-fly, an heroic diesel job. Tunnel #5 is 1170 feet long, and was caved in in three places. The most westerly 600-feet were clear. After that, a pyramid-shaped slide, 40-feet wide, blocked the track. For another 200-ft. it was clear, then a 10-ft. slide broke through the roof. The first 200-feet from #5's east end was found in fair shape, but a 30-ft. slide blocked further investigation. It wasn't until Aug. 3—13 days after the quake—that engineers decided that #5 would have to be by-passed temporarily. Within half an hour M-K had been notified, and telephone and radio circuits were already open and humming, as the call went out for still more equipment. Tunnel #6—360 feet long—was daylighted soon after the project began.

Within 24-hours after Southern Pacific's original survey, dozers were cutting roads to the tunnels—3 miles of winding access. They are good roads,

ful floodlights, their generators set-up nearby,

Dozer driver volunteered for this hazardous job of being first to descend to bottom grade—grade was about 35%.



Cracked tunnel entrances indicate the severity of the earthquake which halted service on the Southern Pacific near Tehachapi on July 21. Diesel earthmoving equipment was used to "daylight" three of four damaged tunnels. The fourth was salvaged.

Quake opened cracks as wide as 30 in. and some 4 to 5 ft. in depth.

used by not only diesel equipment but by engineers, driving their own automobiles. Each contractor has his own service crews for his diesel equipment. They've staked out trees in a sparsely wooded area a mile and a half from the scene—down the tracks at Bealville. Shift hours are from 4:30 p.m. to 3 a.m., then a three-hour equipment break, with the dayshift beginning at 6:00 a.m. and carrying through to 4:30 p.m. The three-hour early morning period is just enough time to grease and make minor repairs for the dayshift. Lubrication for the nightshift is done on the run—with each contractor setting up field service facilities atop the tunnel #5 cut.

H. Earl Parker's set-up is typical. There, two lube trucks and a 1750 gals. fuel truck are parked on either side of a bulldozer-wide cleared space. They form a kind of service "island"—between which the dozers lumber for refueling and repair. Major repair is done at Bealville. When a dozer tracks up to a service-maintenance facility, not one, but perhaps half a dozen men swarm over it, lubricating, testing cables, and refueling. By actual stopwatch, these crews have been getting diesel equipment on their way in less than 4-minutes, sending them back to the hill.

The "hill" itself is one of the most spectacular of diesel work parades. The decomposed granite (fairly easy working) is dozed down and picked up by carryalls, raising the fill to railroad grade in 6-inch lifts. Cut and filling is a continuous, non-stop circular course; down the cut, over the fill, back up again by a narrow, steep incline. Sometimes—often in fact—dozers are spaced blade to carryall over the ¼ mile course. At night power-

Not only is the job large in cubic yards, but during 24 days after the main shocker, some 300 after-

of these cars carry gravel ballast, and the trains themselves help to tamp down the new-laid rails.

ful floodlights, their generators set-up nearby, illuminate the scene. Most of the light plants are Kohler, 1200-1500 watt and there are several dozen of these, in addition to the dozers' own lights, two ahead, one behind. There's no slow down of work just because the sun goes down. The same astounding production is maintained: 35,000 cu. yds. a day, with as much as 45 cu. yds. shifted each minute!

Project superintendent for Morrison-Knudsen Co., Inc. is H. L. Leventon, a veteran of construction jobs around the world. He and James W. Corbett, Southern Pacific's vice-president in charge of operations; E. E. Mayo, S.P.'s chief engineer; R. W. Putnam, Southern Pacific's Engineer of Maintenance; and W. M. Jaekle, assistant engineer of maintenance for the railroad, have been on the job since a few hours after the quake. Jim Miller, M-K's maintenance chief on the job, had just finished work on San Francisco's Broadway street tunnel and was in New Mexico inspecting some diesel equipment for the construction company, when a telegram summoned him back to California. Within 15-hours he was on the jobsite—setting up a diesel maintenance field shop. Says Miller, "We haven't had time here to establish what you'd called a 'preventive maintenance' program. We're engaged at the moment—about 23 hours a day—in plain, emergency 'operating maintenance.' Keeping the dozers running and getting them ready for the next shift."

When Miller arrived at Bealville, there wasn't a nut or bolt that would fit a dozer. A day later he was maintaining 50 dozers—and keeping them on the job. Coordination like this has brought into play airplanes (which fly men and parts in from San Francisco and Los Angeles), special buses

When tractor pulled up between lube and fuel oil trucks, not one, but half a dozen men went to work, lubing, checking and getting the diesel back on the job.

Fill being brought from two directions simultaneously as work progresses.

(which bring work crews out to the site from Bakersfield) and work trains—which lumber in from both ends of the break. Both Santa Fe, which also uses a portion of this main Central Valley line, and Southern Pacific, have been running work trains, carrying diesel equipment as well as ballast for track laying. No one knows for sure—and won't until all statistics are in—just what this biggest of big diesel projects will cost, but rough estimates run to $2,000,000. It would have required almost 90 days to repair tunnel #5 alone—a factor which prompted the shoo-fly, despite the stupendous earth moving job. "At one time," says an engineer on the job, "we had 9 dozers and carryalls up to 20 cu. yds. working in an area no bigger than a football field."

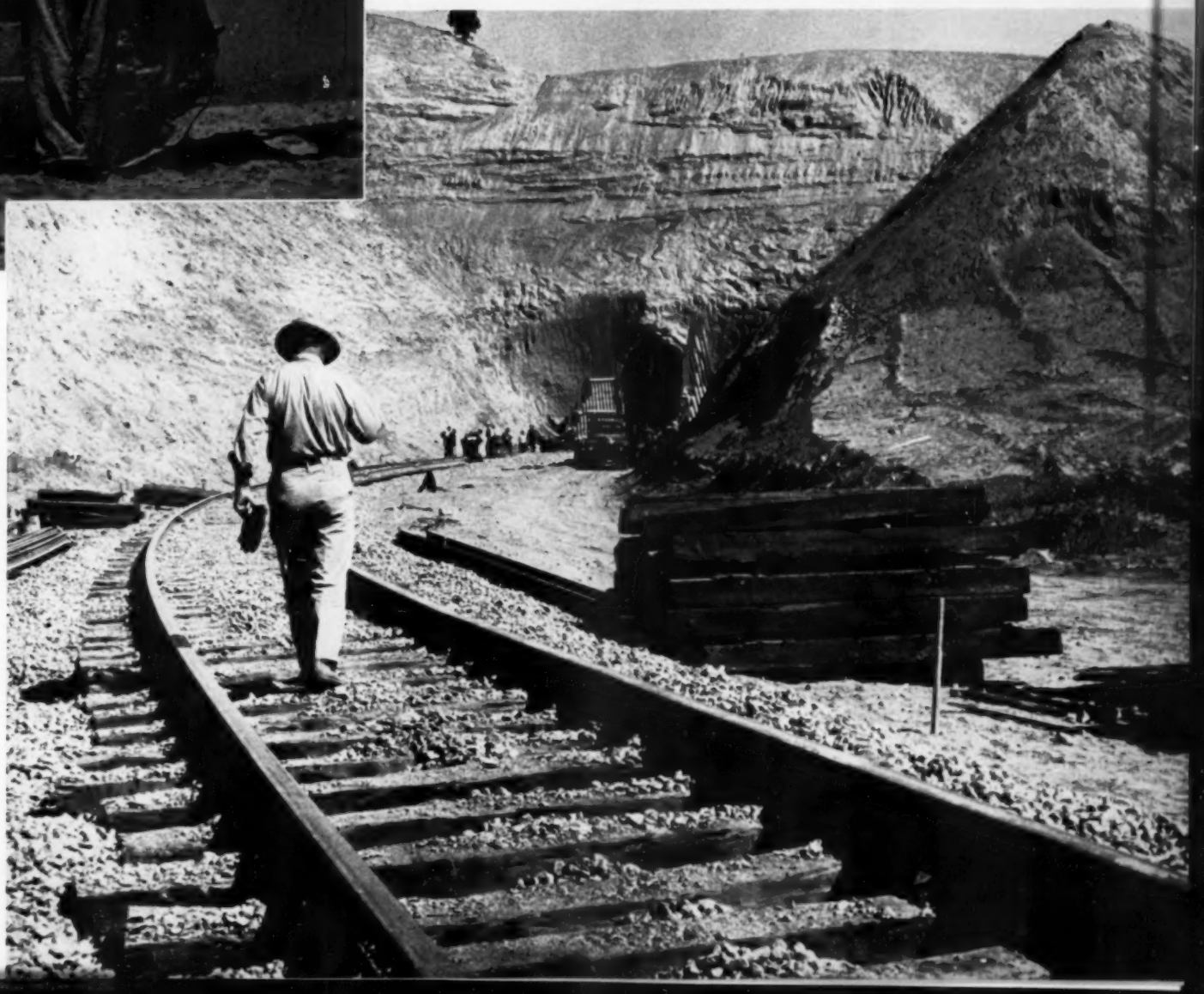
These facts, plus the staggering number of diesels at the site, are the basis for the calculated opinion that on no other job has so many pieces of equipment been set to work within so confined an area.

Not only is the job large in cubic yards, but during 24 days after the main shocker, some 300 aftershocks had been felt. Diesel men have ben jolted in their seats—although none have been knocked off their rigs as one newspaper account reported. While I was on the job, a small jolt shook the job and one dozer driver laughed, looked at his watch, and said, "Right on time—we usually get them every 3-4 hours, and always about noon."

One reason why three cuts and two fills were necessary is that a gentle curve between what remains of Tunnel #3 and daylighted tunnel #6 is necessary. It was desirable to have no more than about 15-degrees radius curve. Thus, not only did a substantial amount of fill for shoo-flys become necessary, but also some cutting back into the mountains to allow for proper curves. The track laying crews are following almost upon the tires of the carryalls—with track being put down less than 30-feet from where the dozers are still bringing the fill up to grade. The diesel picture is complete: 170 pieces of equipment are churning down the cuts and to the fills. Diesel locomotives are pushing work trains to the very end of the track break, from each end, and pulling out empty cars. Some of these cars carry gravel ballast, and the trains themselves help to tamp down the new-laid rails. Inside tunnel #5, dieselized shovels are working to clear the debris. And diesel trucks, many of them Macks, are hauling concrete and sand to help with tunnel repair. On all roads leading close to the worksite, diesel flatbed trucks are hauling diesel equipment in and out—as new rigs arrive at the site, and as tired ones are hauled out for other work, or for major repairs. Actually, however, maintenance men report very few major breakdowns.

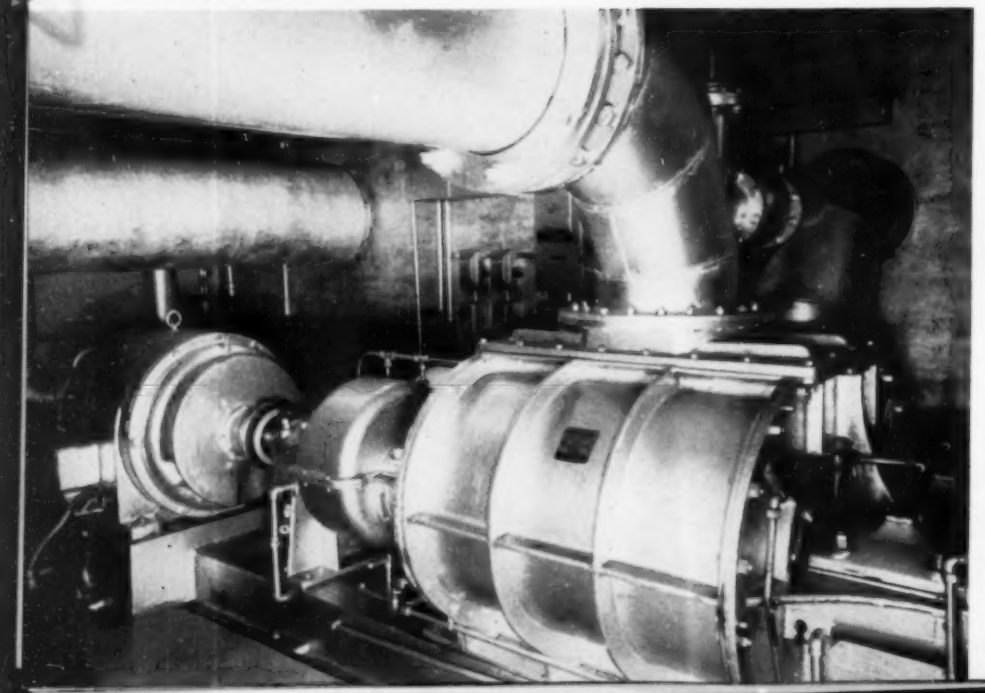
The shoo-fly roadbed, now being thrown up, will be about 4000-feet long. Beneath it is a 450-ft. culvert, necessary to drain some new streams which began to flow as the quake opened the mountain side. Cracks are everywhere at the scene—but most of them aren't over 30-inches wide, nor more than about 4-5 feet deep. Diesel men and construction engineers—never ones to get excited about projects—are admittedly a little awed as they watch the regiments of diesel equipment at work. It's as a Southern Pacific construction engineer says, "A great example of American free enterprise—dieselized."

Newly laid track looking toward portal of #3. Tunnel did extend where man is walking, but since it was ruined in quake, area was dozed out, tunnel removed by 206 ft. of its length, and new portal built (background).



Chief Engineer T. A. Cooper inspects the 2000-hp. dual-fuel engine which is producing power at an average fuel cost of 2.73 mills per kw.hr. This view shows the Woodward governor and the Madison-Kipp cylinder lubricators.

Scavenging air is supplied to the 2000-hp. engine by this Roots-Connersville blower driven by a 125-hp. Fairbanks-Morse induction motor.



WEATHERFORD, TEXAS

Texas Municipal Plant Switches 2,000-Hp. F-M Unit to Natural Gas and Produces Kw.Hr. for Fuel Cost as Low as 2.49 Mills

CONVERSION of a 2,000-hp. Fairbanks-Morse diesel to dual-fuel operation is saving the Weatherford, Texas, municipal power plant more than $16,000 a year. The converted unit has produced a kilowatt-hour for a total fuel cost as low as 2.49 mills and is averaging 2.73 mills. Compared with diesel fuel costs of 6.49 mills, even the higher dual-fuel figure represents a saving of 3.76 mills per kwh., a cost reduction of 58 percent. When the Weatherford municipal plant was put into operation in 1941, the cost of diesel fuel was 3.25 cents per gallon. Today, the same fuel costs 8.50 cents per gallon. With natural gas available at Weatherford for 20 cents per thousand cubic feet, one penny will buy about 54,000 Btu. for natural gas and only 16,500 Btu. when diesel fuel is used. These figures led Mr. Conrad F. Russell, Utilities Manager, to take advantage of the cheaper fuel by converting the largest engine in the plant for dual fuel operation.

Prior to 1941, Weatherford, Texas, located in the farm (noted for big watermelons) and ranch country about 30 miles west of Fort Worth, was supplied with power by a public utility. However, the citizens of the growing community, interested in better service and lower rates, voted to start a municipal power system. An attractive plant building was erected, and three 450-hp., Fairbanks-Morse, Model 32E-14, 6-cylinder, crankcase scavenging diesel engines were installed. The plant was soon expanded with the addition of a 1200-hp., 6-cylinder, pump-scavenging, Fairbanks-Morse diesel engine, Model 33F16. The city operated a competitive plant until 1947 when the public utility franchise expired. The city then took over the entire load and further expansion of generating capacity was necessary, so another unit was purchased. Once again a Fairbanks-Morse engine was selected, this time a 10-cylinder, 16 x 20, Model 33F-16 diesel rated at 2000-hp. at 300 rpm. The 2000-hp. unit was converted to dual fuel operation in May, 1951.

The month of December, 1951, demonstrated what could be achieved in fuel economy through use of the dual-fuel engine. During this month, the dual-fuel unit produced 361,000 kwh. and consumed fuel oil costing $199.75 and natural gas costing $699.19. This meant a cost per kwh. of 0.55 mills for pilot oil and 1.94 mills for gas, a total fuel cost of 2.49 mills. The oil-burning engines produced 211,081 kwh. and consumed fuel oil costing $1,371.14, a cost per kwh. of 6.49 mills.

The impressive economy of dual-fuel operation naturally has resulted in a heavy work schedule for the gas-burning engine. Here are the figures on kwh. production, fuel consumption and engine-hours for the 2,000-hp. unit for the first three months of 1952:

Month	Kw.	Hours	Gal. Pilot Fuel	Mcf. Gas
Jan.	427,000	403	2750	4365
Feb.	329,000	321	2430	3505
Mar.	343,000	327	2250	4041

During this period, the engine generated 1,099,000 kwh. Fuel oil consumption was 7,430 gal. or 0.0067

The Weatherford, Texas, municipal generating station houses five Fairbanks-Morse engines providing all power and light for the community.

	Dual-Fuel Unit		Oil Engines		Total Plant	
	Total	Mills per Kwh.	Total	Mills per Kwh.	Total	Mills per Kwh.
Kwh. Gen	361,000		211,081		572,081	
Cost Fuel Oil	$199.75	0.55	$1,371.14	6.49	$1,570.89	
Cost Fuel Gas	699.19	1.94			699.19	
Total Fuel Cost	$898.94	2.49	$1,371.14	6.49	$2,270.08	3.96

gal. per kwh. Gas consumption was 11,911 Mcf. or 10.83 cu. ft. per kwh. At this rate of consumption, the costs are 0.57 mills for pilot oil and 2.16 mills for gas, a total of 2.73 mills per kwh.

Even before the advent of natural gas fuel, this was a successful plant with improvements in operating efficiency quickly reflected in greater profits. The auditor's report of the 1950-51 fiscal year reveals that a profit of $85,666.71 was realized on a gross power sales of $253,873.34. During this period the dual fuel operation was just getting underway. The single month of January, 1952, reveals a net profit of $7916.55 on a gross sales of $21,187.19 reflecting an increase in the percentage of profit. The city power plant still is not adequate to meet the expanding needs of the rapidly growing community and so further plant expansion is planned. The management has been so pleased with the economy of natural gas fired dual-fuel engines that an agreement has been made to acquire two 1600-hp. opposed-piston Fairbanks-Morse dual-fuel engines.

Mr. Tom Cooper, Chief Engineer at the plant, reports that the condition of the lubricating oil has remained unchanged from oil change to oil change since conversion to dual-fuel operation. Previously oil filters had to be changed twice a month, now the same elements serve for six months. Mr. Cooper's maintenance program calls for inspection and overhaul once each year. At the time of the inspection in February, 1952, the 2000-hp. unit had been in service for a total of 11,143 hours. The engine is still equipped with the piston rings that came on the new engine, and at the February inspection, ring and piston wear were negligible.

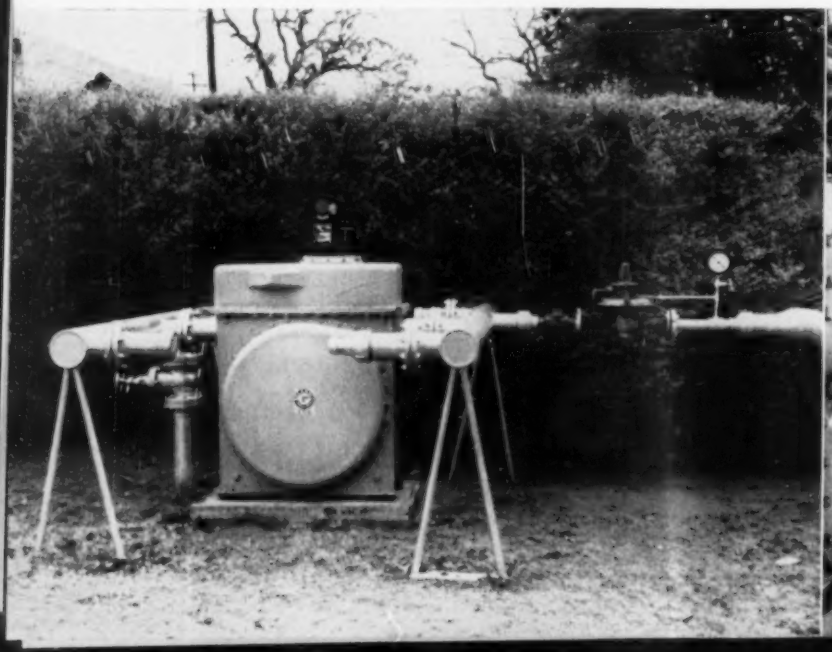
The 2000-hp. dual-fuel engine is a completely independent unit with its own cooling and lubricating system. The prime mover is a 16 x 20, Model 33FD-16 dual fuel, 10-cylinder, 2000-hp. at 300 rpm. engine direct-connected to a 1375 kva., Type TG 20 generator. Generator excitation is furnished by a belt-connected exciter. The operator controls the starting and operation of the engine from the control panel supplied by the manufacturer. Compressed air from two compressors located in the basement of the plant provides the starting air. The air for combustion is handled by a Roots-type blower driven by a 125-hp. electric motor also located in the basement below the engine. The other element required for operation, fuel, is supplied from two sources. First, the pilot oil (diesel oil as used by the straight diesel engines in the plant) is stored in two 15,000-gal. steel tanks located well behind the building. The fuel flows by gravity to the day tank where it is picked up for delivery by the engine. The gas comes from the main, is reduced in pressure and metered by the gas company and supplied to the engine. In case of gas failures the engine can shift immediately to straight diesel operation. The governor provides speed and load regulation for both diesel and dual fuel operation. The operators use a heavy duty, detergent oil in the lubricating oil system. An engine driven lubricating oil pump delivers the oil to the bearings and (for cooling) to the pistons. The oil is piped through oil coils in an evaporative cooler. Lube is pumped continuously through cellulose filter elements for oil purification. A motor-driven pump is used to circulate the lubricating oil for before-and-after operation service. To reduce the noise level and to provide clean air for the engine the combustion air enters through a dual air filter, while the products of combustion pass out through an exhaust silencer. The cooling water for the engine is passed through an evaporative cooler which serves only the 2000-hp. engine. The other engines in the plant make use of a closed system with heat exchangers. The cooling water for these exchangers is in turn cooled in a spray pond located directly behind the plant.

The attractive powerhouse also serves as the electrical distribution center for the system. Each generator has a separate electrical panel and the main board has panels for each of the feeder circuits. Space has been provided in the existing building for the proposed expansion, and further expansion can be taken care of by extending the existing structure according to prearranged additions. As the Weatherford plant expands, permitting the generation of more and more power with cheap natural gas, the already efficient utilities department will make a greater contribution to the taxpayers of the community.

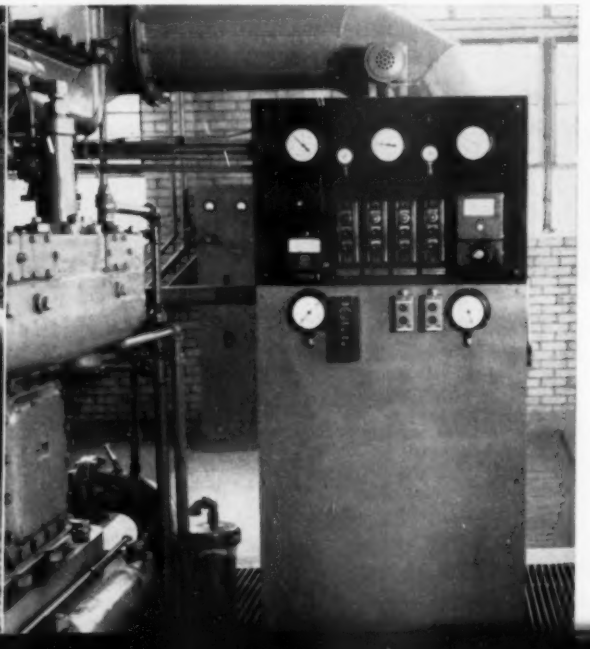
List of Equipment for 2000-hp. Engine

Engine—One 2000-hp., 10-cylinder, 16 x 20-in., Model 33FD16 dual-fuel unit rated at 300 rpm. Fairbanks, Morse.
Governor—Woodward.
Fuel filter—Nugent & Co.
Lube oil—The Texas Company.
Cylinder lubricators—Madison-Kipp.
Lube strainer—Purolator.
Oil purifier—Honan-Crane.
Before and after pump—Roper.
Evaporative cooler—Fairbanks, Morse.
Air filter—American Air Filter.
Exhaust silencer—Maxim.
Scavenging air blower—Roots-Connersville.
Pyrometer—Alnor.
Switchboard—General Electric.
Gas meter—Emco. Rockwell.

Natural gas fuel for the dual-fuel engine is metered by this Emco meter with its Emcorrector for easy reading.



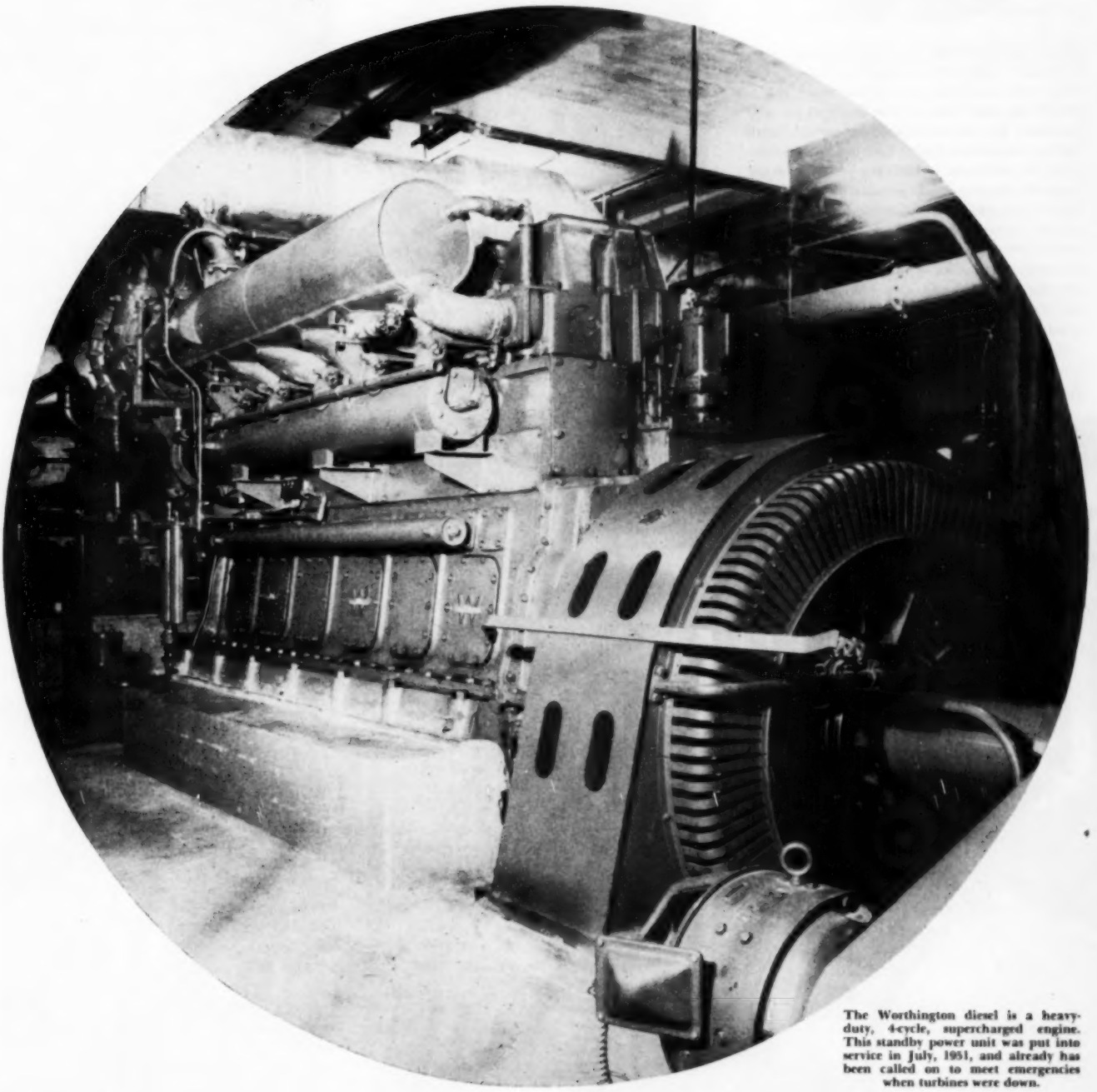
Located at the side of the big engine is this F-M panel which holds an Alnor pyrometer, a day tank level meter, pressure gauges, alarms and push-button controls for auxiliary equipment.



KALAMAZOO PAPER STANDBY DIESEL INSURES OPERATING CONTINUITY

One 865-hp. Worthington Engine Eliminates Utility Service, Guards Against Shutdown of Mill, Helps Weekend Maintenance

By WM. H. GOTTLIEB



The Worthington diesel is a heavy-duty, 4-cycle, supercharged engine. This standby power unit was put into service in July, 1951, and already has been called on to meet emergencies when turbines were down.

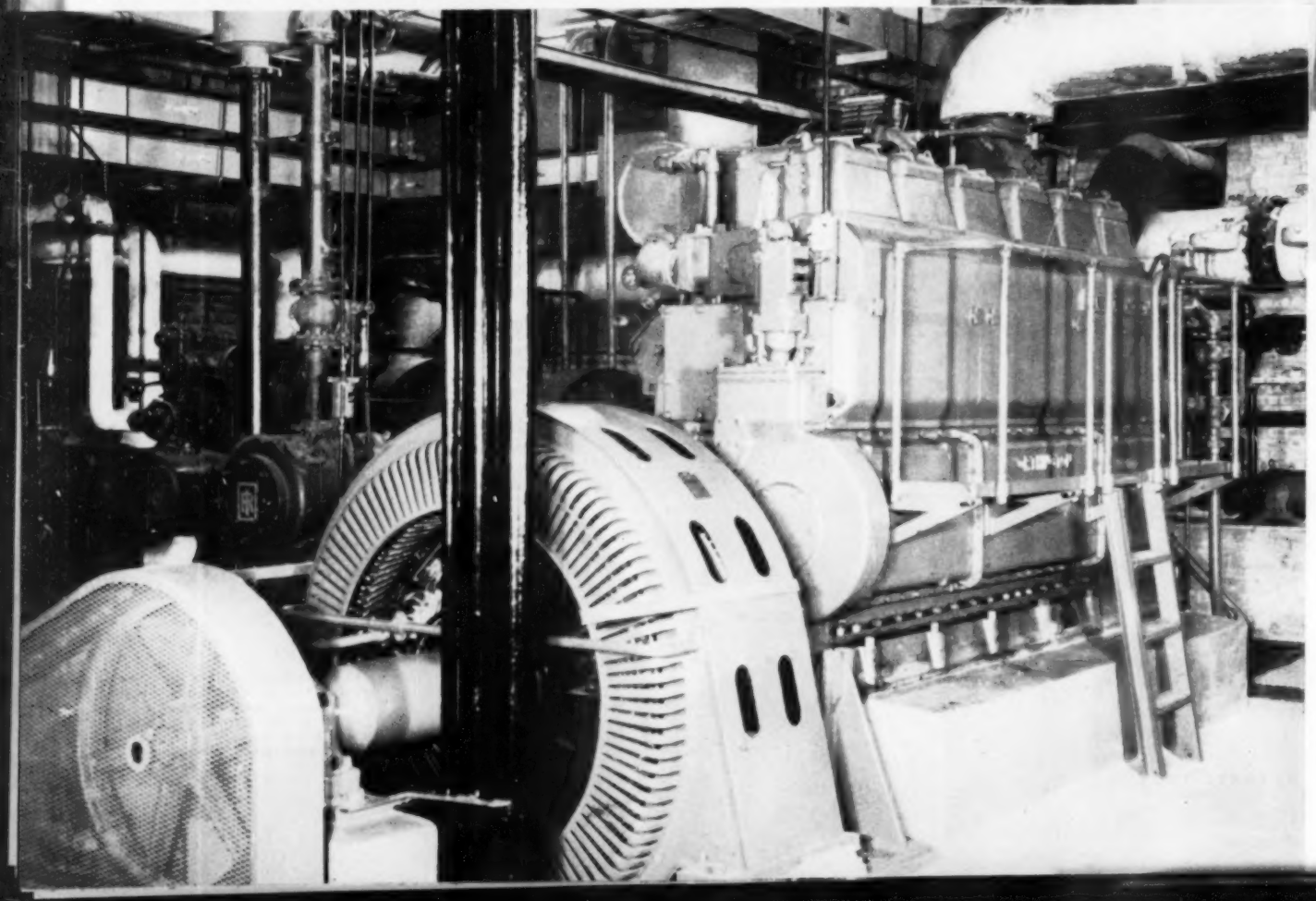
ONE 865-hp. Worthington diesel is performing a vital service and saving money for the Kalamazoo Paper Company in a huge plant where electric power costs are extremely low. This is a pioneer mill, built in 1867 at Kalamazoo, Mich., the first paper mill to be constructed in that center of paper manufacture. Today it is one of the nation's major producers of book and coated papers with six big paper machines and two coating divisions. A large quantity of process steam is required in paper making and it is logical to use this steam in producing power. Consequently the company uses steam turbines to provide its electric power. In all there are eight turbines with combined capacity of 20,000 kw. Process steam requirements exceed power needs and the turbines are in effect just reducing valves in the steam system.

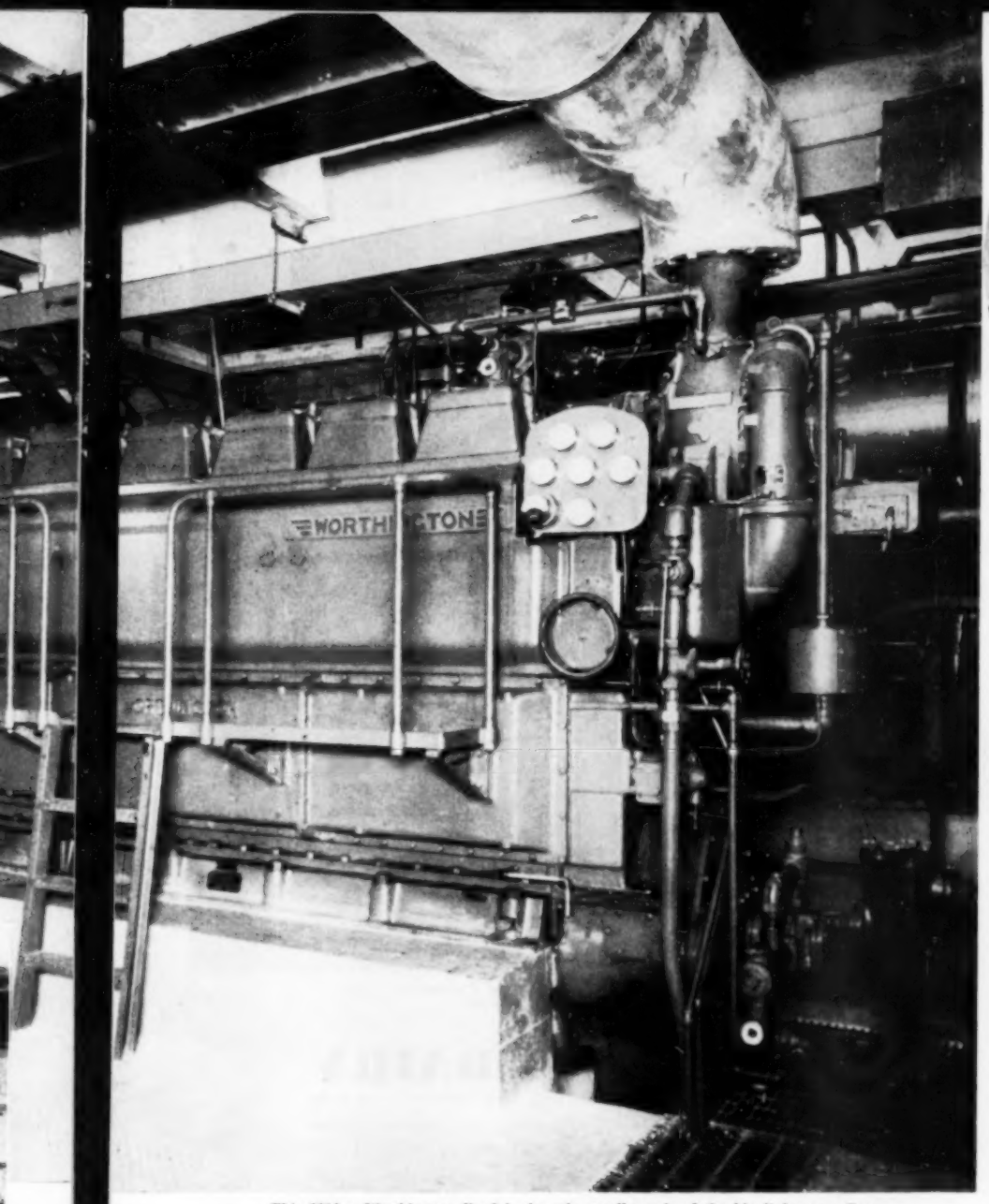
For six days each week, the mill and its two power houses run a full schedule. On Sundays, activity is cut to a minimum and electric load drops as low as 1,000 kw. One boiler is kept fired and one turbine runs. But all steam plant pumps and boiler fans are electrically-driven and the entire plant would be dead if the turbines stopped. Some other source of power would be essential to get the turbines started again. It is considered necessary, too, to have an alternate source of power capable of running the motor-driven fire pumps. Finally, it is customary on Sundays to do maintenance work on the paper machines and other mill equipment and it is efficient and convenient to have a power source which can be called into service as needed.

Kalamazoo management decided that a diesel would be the most economical and dependable means of providing standby power. Since competent operating personnel is on hand at all times, it was found to be considerably cheaper to install a diesel than to pay a power company for standby service. Mindful of the potential importance of the equipment, Kalamazoo Paper picked a heavy-duty prime mover. The engine chosen is a six cylinder, four-cycle Worthington diesel with exhaust-driven turbocharger, rated at 865 hp. at 600 rpm. It drives a 600-kw., 3-phase, 60-cycle, 480-volt Electric Machinery synchronous generator with 7½-kw., 125 volt, V-belted exciter. In emergency, if the turbines are down, the diesel is capable of handling the water pumps, boiler draft fans and the fire pumps. If called on to assist in plant maintenance, the engine can power the largest piece of machinery in the mill. The engine was tested and approved on July 7, 1951, and in the next two months received two calls for emergency service, one because of enforced shutdown of the turbines, one to permit boiler repairs. Whether needed or not, the diesel is run once a week to insure that it will always be ready for emergency.

Fuel economy is not a major consideration in an operation of this kind but it is interesting to note the efficiency that has been achieved. Chief Engineer Karl Hein reports that the engine averages 13.57 kwh. per gal. of fuel consumed. He reported one hour's run during which the diesel produced an even 500 kwh. on 33.3 gal. of fuel, no less than

The Worthington diesel drives a 600 kw. Electric Machinery generator with V-belted exciter. Engine averages 13.57 kwh. per gal. of fuel consumed, has gone as high as 15 kwh.





This 865-hp. Worthington diesel is the sole standby unit of the big Kalamazoo Paper Company mill. Cheaper to operate than power company standby service, the engine starts steam plant auxiliaries in emergency, runs fire pump, turns mill equipment for week-end maintenance.

15 kwh. per gal. The fuel used is a No. 1 oil, low in sulphur, which is delivered at 11.5 cents a gallon. Fuel is stored in a 12,000 gal. underground tank and is transferred by an automatic float-controlled motor-driven pump through a meter to a 300-gal. day tank in the engine room. The oil then flows to a booster pump on the engine which supplies the six injection pumps.

The engine cooling system also is fully automatic. Jacket water is circulated through the engine and a shell-and-tube heat exchanger by a 2½-in. centrifugal pump driven by a 7½-hp. motor. A thermostatic control maintains jacket temperature at the desired level by bypassing water around the exchanger. For makeup, a float-controlled valve in the surge tank admits distilled water from the boiler condensate supply as needed. The main pumps that provide filtered Kalamazoo River water for the mill send raw water through the engine heat exchanger and lube oil cooler. To make sure that no water circuit failure can put the engine out of service, the diesel has an emergency line to the mill's fire system water tower. A detergent-type lubricating oil is used, pumped to the bearings by an engine-driven pump. Intake air is drawn through an oil-bath filter inside the building to the turbocharger. Exhaust gases drive the turbocharger and then vent through a vertical silencer in the room adjoining the engine room.

There is a convenient gauge panel on the engine with a multi-point exhaust pyrometer and pressure gauges on fuel, lube, water, starting air, turbo lube and turbo air. An alarm system warns in case of high jacket water temperature, low lube pressure or low jacket water pressure. Since the engine would be needed most urgently if no electricity were available, the starting air compressor is provided with alternate drives—a gasoline engine in addition to the usual electric motor. The air tank, of course, is kept at full pressure (250 psi.) so that air is ready for instant starts.

Engine air is drawn through an Air-Maze oil-bath filter located in a room adjoining the engine room.

In a mill the size and importance of the Kalamazoo Paper Co. installation, continuity of operation is of utmost importance. Company President G. T. Jubb and Vice-President B. H. Cooper have decreed that power supply must be assured by a dependable standby service. Superintendent of Power and Maintenance T. R. Walter and Chief Engineer Hein feel that their diesel provides this power insurance. The company has no utility line of any kind and even if the diesel did not run at all, it would be saving money in standby charges. Actually, the engine has been called on to perform its primary functions, to operate steam plant auxiliaries in emergency and to provide power for week-end mill maintenance. It is hard to put a price on such services except to say that they are essential.

List of Equipment

Engine—865 hp., 600 rpm., 4 cycle, supercharged, Size SDH-6 diesel. Worthington Corp.
Generator—750 kva., 600 kw., 480 volt, 3 phase, 60 cycle, synchronous generator with 7½ kw., 125 volt exciter. Electric Machinery Corp.
Governor—Woodward Governor Co.
Turbocharger—Elliott-Buchi. Elliott Co.
Fuel oil—Standard Oil Co. (Indiana)
Fuel transfer pump—Worthington Corp.
Fuel meter—Worthington-Gamon.
Lubricating oil—Texaco Ursa P 40. The Texas Co.
Lube filter—Cuno Engineering Corp.
Lube cooler—Sims Co.
Cooling water pump—Worthington Corp.
Heat exchanger—Sims Co.
Thermostatic valve—Fulton Sylphon Div.
Starting air compressor—Worthington Corp.
Air filter—Air Maze Corp.
Exhaust silencer—Maxim Silencer Co.
Exhaust pyrometer—Alnor. Illinois Testing Laboratories, Inc.
Alarm system—Viking.
Gauges—James P. Marsh.

GMC D452-37 diesel truck used for hauling raw milk to the Qualitee milk plant in the background. Pictured are Wayne Bethel of Qualitee on the left and Jim Martin of General Truck & Engine Co., right.

DIESELS SAVE MONEY FOR DAIRY

By **BRUCE WADMAN**

THE Qualitee Dairy Products Association of San Diego, one of the finest and largest dairies in this sunny Southern California town, has recently bought a GMC model D452-37 tank type milk truck for the purpose of picking up raw milk from producers in the surounding rural area. This truck, supplied by the General Truck & Engine Co. of San Diego, is powered by a GMC series 3-71 Diesel, a three-cylinder, direct injection, two cycle, 110 bhp. engine. This is General Motors newest truck engine and is designed to bring the proven advantages of 2-cycle design to the 35,000 pound weight class. Mr. Wayne Bethel of Qualitee has supervised the operation of this diesel truck and has compared its performance with a gasoline engine powered truck of similar size that is used for the same job as the diesel truck. The gasoline engine and the GMC diesel engine both pull almost exactly the same load and travel practically the same routes in their daily milk pickups. Mr. Bethel has compiled a performance table for thirty days of the month of May 1952 comparing the cost of operating the gasoline truck versus the diesel truck.

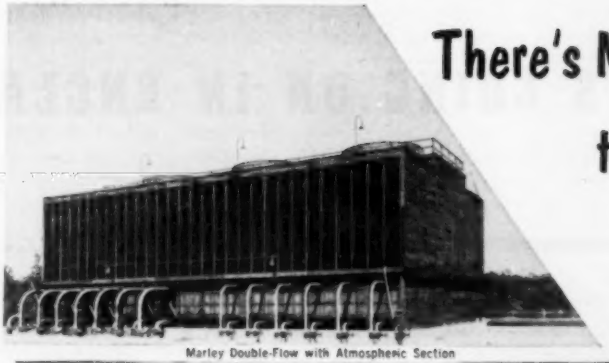
Equipment	Miles Traveled	Gals. Fuel Used	Cost Per Gal.	Miles Per Gal.	Total Fuel Cost	Cost per Mile
Gasoline Truck....	3,628	707	.242	5.13	$171.09	.0471
Diesel Truck.....	3,628	454.3	.195	7.98	88.59	.0243
				Diesel Saving	$ 82.50	.0228

The figures convincingly show that the diesel truck has operated at a fraction of the cost of operating the gasoline truck.

This Dairy Association is strictly a producers' cooperative, and it serves the San Diego area and the towns in a 35 to 40 mile radius of San Diego. About 110,000 pounds of milk a day is distributed. Qualitee and its fleet of milk trucks travel close to 12,000 miles per month. Quailtee produces all types of dairy products and operates on the basis of quality buying of milk. It offers a bonus incentive to producers who produce a superior quality milk and penalizes producers who produce a low grade of milk by reducing the price paid for their milk. I was very impressed by Qualitee's spotless plant, which contains the very latest equipment for the sanitary and quality production of milk and its by-products. They have taken another step in the direction of more efficiency with the acquisition of their first dieselized truck, whose performance prompted Mr. Bethel to say to me, "If the diesel now operating will perform in the future as it has in the past, we are looking forward to acquiring our next diesel."

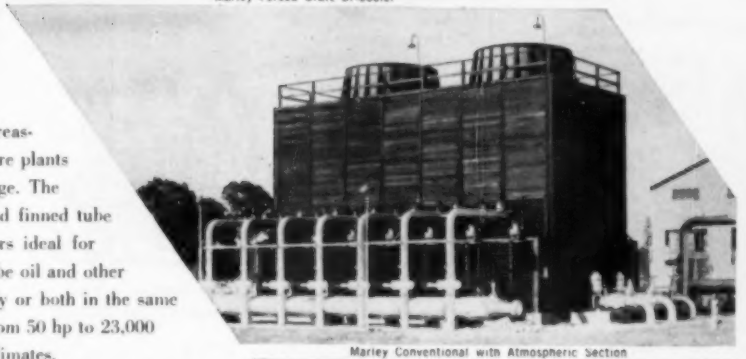
Our compliments go to Qualitee Dairy Products Association in being discriminatory in their wise choice in discovering diesel economy in its most convincing manner. This application of a diesel to a truck which doesn't operate on long hauls, but is constantly starting and stopping to pick up its load from various concentrated points is another development that shows that more and more the diesel engine is finding its way into new fields of power generation.

There's More Than One Way to Cool Engines . . . and MARLEY has them ALL!



Marley Double-Flow with Atmospheric Section

Marley Forced Draft Dri-Cooler



Marley Conventional with Atmospheric Section

Natural Draft with Atmospheric Section

Whatever method of cooling your plant requires, whether cooling medium be air or water, you'll find the finest equipment in the complete Marley line.

Marley Dri-Coolers are increasingly popular as more and more plants utilize air cooled heat exchange. The flexibility of header design and finned tube arrangement makes Dri-Coolers ideal for cooling of jacket water and lube oil and other high level cooling, either singly or both in the same unit. They now serve plants from 50 hp to 23,000 hp, in many countries and climates.

For water cooling, Marley has long set the standard. Marley patented Double-Flow, Conventional induced draft and atmospheric towers are all adaptable for indirect cooling through standard Marley atmospheric sections. Marley towers and sections are completely integrated units and the range of sizes fits every requirement of any size plant.

PRECOOLING AIR is another function of Marley cooling towers. In a single installation 40 Marley Aquatowers are in this type service.

MARLEY

The Marley Company Inc.

Kansas City 5, Missouri

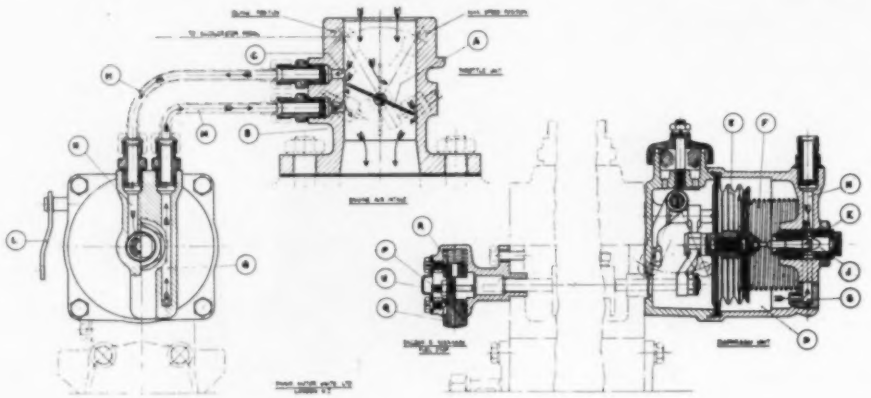
WHAT'S GOING ON IN ENGLAND

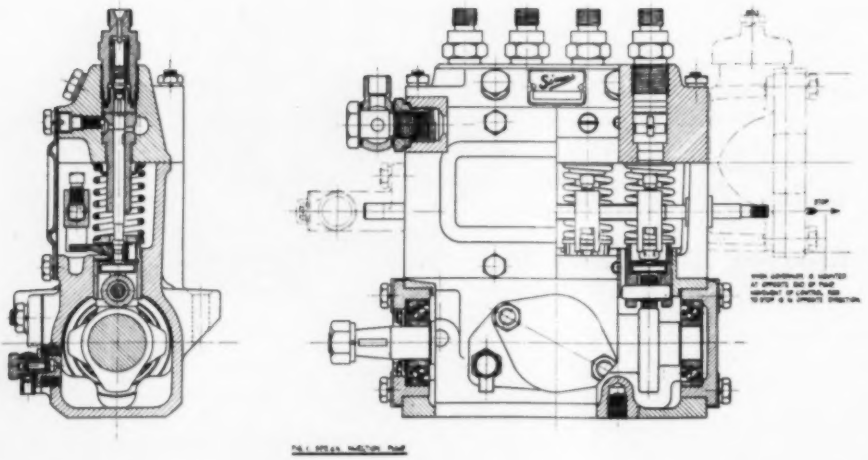
CONDUCTED BY **HAMISH FERGUSON**

Hamish Ferguson was appointed secretary to the Diesel Engine Users Association in London in 1944. Previously senior technical assistant to Diesel and Insurance Consultants, London, and for several years with English Electric Company in the designing and erection of large diesel generating plants. Mr. Ferguson continues to do independent consulting work.

A NEW COMBINED FUEL PUMP AND PNEUMATIC GOVERNOR

SINCE the war, Simms Motor Units Ltd., of London, have devoted much time to the development of new fuel injection equipment having in mind, particularly, the rapid increase in the usage of the smaller diesels for agricultural work. These engines have a capacity of about 1 litre per cylinder and operate at speeds around 2,000 rpm. The new Simms S.P.E. pump with pneumatic governor has been designed to suit engines of this type and special attention has been paid to simplicity, robustness and freedom from trouble.

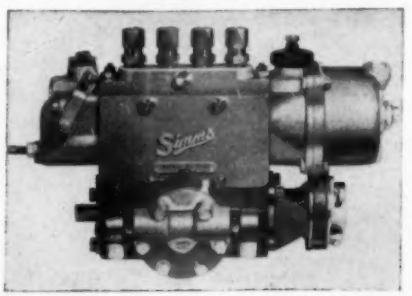




Injection Pump: The pump is of the conventional multi-element in-line type, but in detail construction possesses some new features. Although the element design incorporates the normal spill method of control, particular attention has been paid to the plunger design with a view to securing the maximum service life. The inclined control edge on the plunger is formed by a small inclined groove on the surface of the plunger communicating with a central drilled passage. This preserves the maximum bearing surface on the plunger and reduces possible leakage paths. It is claimed that with this design of element resistance to abrasive action due to dirty fuel or defective filtration is improved. This is important for agricultural tractors and similar applications, particularly in those overseas markets where extremely dusty conditions and lack of skilled maintenance may be expected.

To rotate the plunger to vary the quantity of fuel delivered, the usual rack and pinion mechanism

Left top: **Schematic drawings showing the engine air intake, the excess and maximum fuel stop and the diaphragm unit.** ***Bottom left:*** **Drawings of the injection pump.** ***Below:*** **The Simms S.P.E. pump with pneumatic governor.**



is replaced by a lever projecting from the bottom end of the plunger which engages with a fork clamped to a square control rod. The fork can be moved along the control rod to form a calibrating adjustment. With this construction there can be only one source of backlash, and this at a considerable radius from the plunger, thus minimizing the effect of wear on calibration. The camshaft is exceptionally large in diameter to provide the maximum stiffness required to resist the high injection pressures which are a feature of direct injection engines. For some tractor installations a gauze fuel pre-filter is housed in an extension of the pump body to exclude the possibility of foreign matter entering the pump from the pipe system or when the pump is removed from the engine.

Pneumatic Governor: The governor consists of two separate assemblies; the governor unit and the throttle unit. The throttle unit is mounted between the engine air intake and the air cleaner and contains a butterfly throttle valve A, connected to the driver's accelerator pedal or control lever. This throttle controls the speed of the engine, there being no direct connection between the driver's control and the fuel pump. Two ports, B and C, are arranged in the throttle unit so that when the throttle valve approaches the closed position one port is on the engine side and the other on the atmosphere side of the throttle. These ports are connected by suction pipes to the governor unit.

The governor unit is mounted on the end of the injection pump and comprises a housing containing a diaphragm E, which is attached to the pump control rod. When the pump is at rest this is held in the maximum fuel delivery position by the spring F. The diaphragm, which is a synthetic rubber moulding, is retained in the rear half of the housing by a steel plate and spring ring. At the opposite end of the housing are two ports G and H to which the suction pipes are connected. Port G is in direct communication with chamber D while port H communicates with the external annular groove in the damping valve guide J. This annular groove is connected to the main chamber by cross holes communicating with the central bore of the guide J in which slides the damping valve K, which is attached to the diaphragm. A stop lever L is provided which moves the pump control rod to the "no delivery" position when it is desired to stop the engine.

The suction pipe M connects the port B on the engine side of the throttle with the diaphragm chamber D, via the port G, and the auxiliary suction pipe N connects the port C on the atmospheric side of the throttle with this main chamber D, via the port H and damping valve guide J.

Operation: When the throttle valve is moved to the closed position an increased suction is created on the engine side of the throttle valve. This is transmitted through the suction pipe M to the diaphragm which is drawn back against the pressure of the spring F, thus moving the pump control rod so as to reduce the fuel delivery. Closing the throttle reduces the engine speed, while by opening the throttle the suction on the diaphragm is reduced so that the spring F moves the pump control rod towards the increased fuel delivery position thus increasing the engine speed. The purpose of the damping valve K is to prevent hunting or surging of the engine at idling speeds. This is accomplished by adjusting the valve guide J, so that when the diaphragm is in the slow running position the tapered portion of the valve will admit air from the port H, via the external annular groove and cross holes in the valve guide J, into the chamber D, if the diaphragm moves too far towards the stop position due to surges in the engine speed. As the valve guide J is connected to the auxiliary suction pipe N, it is at approximately atmospheric pressure. The damping valve therefore acts in the same way as a buffer spring and prevents excessive oscillations of the diaphragm at idling speeds.

When the engine is running at maximum speed, i.e., with the throttle valve fully open, the depression in the air intake will be very small, and the maximum speed of the engine will be determined by the increasing air velocity which, as the engine speed increases, causes a gradually increasing suction on the port B and this, transmitted to the diaphragm, draws back the pump control rod and limits the speed of the engine. An excess fuel stop is mounted on the end of the pump opposite to the governor. This stop contains the maximum fuel stop screw P which limits the travel of the pump control rod towards the maximum fuel delivery position under pressure of the spring F. The maximum fuel stop screw is adjusted so that the pump delivers the correct quantity of fuel for the type of engine to which it is to be fitted. A particular advantage claimed for the governor is that it is of the variable speed type. If the throttle is held in a fixed position the engine will run at a correspondingly constant speed, the variation between full load and no load being of the order of 5 to 10 per cent. Thus governing speed can be obtained at any selected speed within the designed speed range of the engine and the equipment is, therefore, equally suitable either for vehicle engines or marine engines where a variable speed governor is usually essential.

Export Agreement

All export activities of the Automotive Replacement Products Division of the Bohn Aluminum and Brass Corp., of Detroit are to be handled by Borg-Warner International Corp. The agreement has been announced jointly by J. W. DeLind, Jr., president of Borg-Warner International, and P. W. Sloan, general manager of Bohn. Bohn is a manufacturer of bearings, connecting rods and other automotive engine components. Mr. DeLind also announced that Borg-Warner International has virtually completed its postwar program of establishing warehousing distribution outlets, with a rounded out line of automotive replacement parts throughout the world.

YOUR COPY OF DIESEL ENGINE CATALOG in its seventeenth completely re-edited, revised and expanded edition is now off the press. An invaluable aid to design engineers and buyers, it incorporates the latest diesel engine specifications and descriptions. Order your copy of this limited edition now. Profusely illustrated. $10.00. Mail checks to DIESEL PROGRESS, 816 North La Cienega Blvd., Los Angeles 46, California.

Promotes District Men

T. J. Kehane, general sales manager, Worthington Corporation, Harrison, N. J., has announced the appointment of J. P. McArthur as manager of the company's Philadelphia district sales office, succeeding the late W. J. Daly. Mr. McArthur was formerly regional manager of west coast sales. H. W. King, formerly manager of the San Francisco district office has succeeded Mr. McArthur as regional manager, west coast sales. P. L. McManus, formerly resident salesman in Portland, Ore., has been appointed manager of the San Francisco district office. Mr. McArthur, a graduate of Penn State, joined Worthington in 1936 as an application engineer in the Philadelphia office. Subsequently he became attached to the Marine Division and was appointed Pacific Coast manager of marine sales until 1944 when he was given the post of San Francisco district office manager. In 1949 he was made regional manager of west coast sales. Mr. King started his career with Worthington in 1923, after graduating from the University of California. He was successively a general line salesman in Kansas City and Seattle district offices and has been manager of the San Francisco district office since 1949. Mr. McManus holds a B.S. degree, University of Kansas, 1935; and M.S. from the University of Idaho. He joined Worthington in 1936 as a rock drill demonstrator in Seattle, and subsequently was a resident general line salesman in Idaho and Ohio. After military service during the past war, he returned to Worthington in 1946.

Shrimp Trawler

A G.M. 110 diesel has been installed in the *Magic Valley*, a 67x18 Tams designed shrimp trawler owned by Sam Snodgrass of Brownsville, Texas. Built on the banks of the San Sebastian in St. Augustine by the Diesel Engine Sales Co. The 48x46, four blade Columbian propeller pushes it at about 12 knots. A 2 kw. model 8 Sheppard diesel generating set supplies auxiliary power; the 3 drum Stroudsburg hoist operates from a power take-off on the main engine. Florida Diesel Engine Sales Co., General Motors, Jacksonville, supplied the main engine.

Borg-Warner Officers

L. G. Porter and Ray P. Johnson have been elected vice presidents of Borg-Warner International, the export trade division of Borg-Warner Corp. Mr. Porter is also treasurer of Borg-Warner Corp. and Mr. Johnson is administrative assistant to the president of Borg-Warner Corp. Robert A. Brown, comptroller, has been elected treasurer of Borg-Warner International, J. W. DeLind, Jr. has been re-elected president and R. W. Dose has been re-elected secretary.

Moved to New York City

Robert S. Oberlander

George H. Lynn, general sales manager, Hamilton Works, Baldwin-Lima-Hamilton Corporation, Hamilton, Ohio, announces the appointment of Robert S. Oberlander as factory representative for the application and sale of both Hamilton and Baldwin stationary and marine diesel engines on the Eastern Seaboard north of Washington, D. C. Headquarters for this area are at Baldwin's New York City office, 60 E. 42nd Street. Mr. Oberlander has been with the Baldwin organization since 1941 and with its diesel engine department since 1943, becoming manager in 1950. Manufacture of Baldwin diesels for stationary power and marine service was moved from Eddystone, Pa., to Hamilton, Ohio, the following year.

New Petter Agents

Petter Small Engine Division of Brush Aboe, Inc. has recently appointed two new direct factory agents, thus embracing five more states in its extensive sales and service organization. The new agents are: M. D. Moody and Sons, Inc., 4652 Phillips Highway, Jacksonville 7, Fla. and John Lundahl Company, 5075 Manchester Street, St. Louis 10, Mo.

M. D. Moody has accepted the franchise for the state of Florida and John Lundahl for the states of Missouri, Illinois, Indiana and Kentucky. These two appointments follow the increasingly successful pattern of decentralizing the responsibility for sales promotion, and a great deal of market research and selection is still being undertaken to provide other states with exactly the right agent to give the maximum of assistance to the man who requires the Petter engine for his particular application.

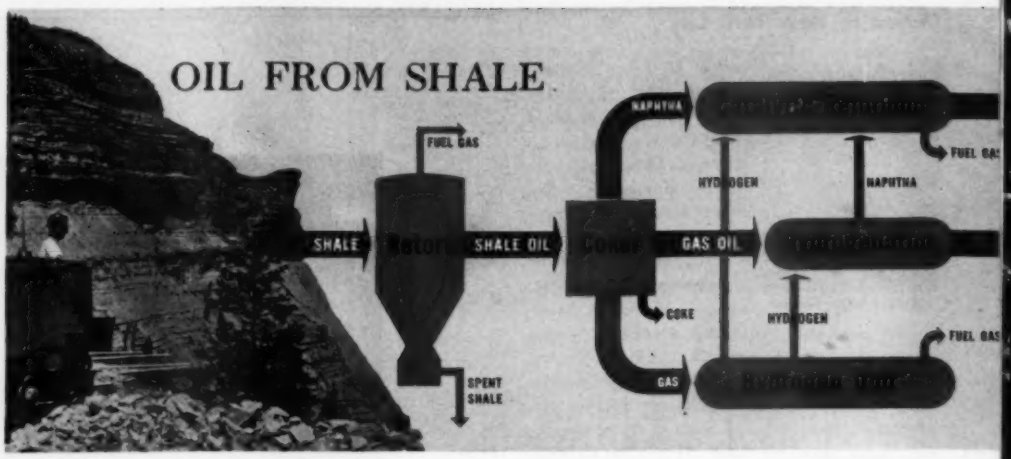
Caterpillar Dealer

Murphy-Campbell Co. has been appointed Caterpillar dealer for Grays Harbor, Lewis, Mason, Pierce, and Thurston counties and a portion of Pacific County in the state of Washington. Frank J. Murphy and Barney C. Campbell, partners in the new company, are both natives of Seattle and have had extensive experience in the excavating and earthmoving contracting business. Charles S. Burdell is secretary of the organization. Complete sales and service facilities for Caterpillar machinery are presently located at Tacoma and Centralia. Plans are under way for new facilities at Tacoma.

Sales Executives

Farr Company of Los Angeles, manufacturers of air filters and air filtration equipment, has announced the appointment of Robert S. Bebb of Los Angeles as division sales manager supervising the western division. James E. Matuska of Seattle, Washington has been appointed district sales manager for the northwest district.

AN ANALYSIS OF SYNTHETIC LIQUID FUELS PRODUCTION COSTS



IT has been a well-known fact that coal and oil shale could be utilized to provide liquid fuels in the event—now only a remote possibility—that the world's supply of crude oils be exhausted or inadequate as a source for future needs. The American oil industry, operating as private enterprise under competitive conditions, has long been exploring the frontiers of producing liquid fuels from coal and oil shale, as well as from natural gas. The industry, which has never failed to fulfill the nation's military and civilian needs during peacetime and wartime, will be ready with suitable processes for manufacturing synthetic oil products if the day ever comes when the world's crude oil production might not equal the demand for petroleum fuels and lubricants.

However, because of the unprecedented demand for petroleum fuels during World War II and the postwar period, and because of the uncertainly in some quarters as to whether this country possessed an adequate supply of petroleum to face another emergency, President Truman in March of 1948 approved a three-year extension of a program originally approved in 1944 for the Bureau of Mines of the Department of the Interior to investigate and develop processes for producing synthetic liquid fuels from oil shale and coal. Since 1948, the Bureau of Mines has constructed demonstration plants, where experimental work has been in progress.

In connection with their work the Bureau of Mines has made and published various estimates on the costs of manufacturing synthetic liquid fuels from coal and oil shale. Since these costs as estimated by the Bureau of Mines are considerably lower than those calculated by well informed industry groups, a controversy developed through various publications on the matter. As a means of resolving at least some of the differences in the Bureau of Mines and industry figures, the Honorable Oscar L. Chapman, Secretary of the Interior, in April, 1950, requested the National Petroleum Council to create a committee to:

1. Review estimates made by the Bureau of Mines of the cost of producing synthetic liquid fuels, and its estimates of comparative costs of producing liquid fuels from crude oil.
2. Prepare independent cost estimates.
3. Make recommendations as to ways and means, if any, for improvement of future cost estimates by the Bureau of Mines.

In response to this request, the National Petroleum Council organized the Committee on Synthetic Liquid Fuels Production Costs, and appointed W. S. S. Rodgers, Chairman of the Board of Directors of The Texas Company, to the chairmanship. One of the initial steps taken by the National Petroleum Council Committee was to establish a subcommittee made up of experts in the synthetic fuels field to assist in analyzing the technical aspects of the highly complicated problem. Contributing companies made available the services of a large number of qualified specialists in research, development, and engineering.

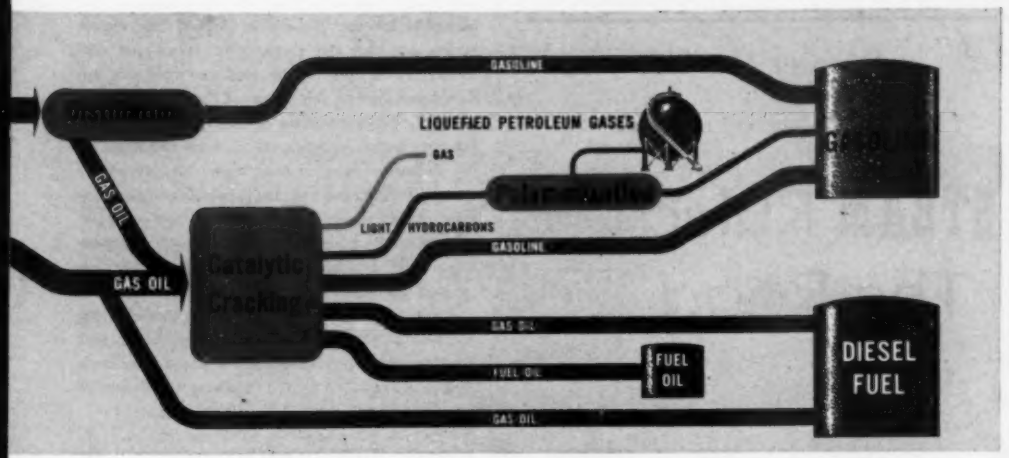
Inasmuch as the Bureau of Mines was not prepared to offer estimates of the costs involved in the production of products from crude petroleum, it was necessary—and the Bureau of Mines so agreed—to remove this phase from the scope of the project. On October 31, 1951, Mr. Rodgers presented the report of his Committee on Synthetic Liquid Fuels Production Costs to the National Petroleum Council. The substance of the report is presented here as a matter of interest to our readers.

The National Petroleum Council's Committee on Synthetic Liquid Fuels Production Costs reported that the synthetic fuels work done by the Bureau of Mines falls into three categories: (1) production of synthetic liquid fuels by hydrogenating coal; (2) production of liquid fuels from oil shale; and (3) production of synthetic liquid fuels by gasifying coal and converting the resulting mixture of carbon monoxide and hydrogen to liquid fuels by some modification of the Fischer-Tropsch process. However, the Committee's report included work completed to date on only the first and second processes since the Bureau of Mines did not have adequate information for the proper appraisal of the process identified in the third category when the National Petroleum Council began its part of the project. Only recently, the Bureau of Mines presented additional data on that process for review by the subcommittee.

In accordance with the scope of the work assigned to the Committee, the investigation was limited to the process steps upon which the Bureau of Mines cost data had been based. To increase the general usefulness of the study the Committee considered it desirable to determine costs not only for possibly unique situations that might arise from a particularly favorable or unfavorable first-plant location, but also for a more nearly average case in which a number of plants would produce a combined total for each process of around 200,000 barrels of liquid fuels per day. Thus estimates of costs and of material requirements were determined for both single plant and multi-plant cases.

The estimates for the coal hydrogenation operation were based on procedures which were developed in Germany and on the assumption that coal was available in sufficient quantities, at a mineable depth and thickness and at a location having sufficient water required for the operations. The coal is prepared for hydrogenation by cleaning and crushing operations which reduce the ash content to as low a value as is practical and which bring the coal to a size suitable for the hydrogenation operation. In the cleaning and crushing operations a large amount of higher ash content and other off-grade coal is produced. This is used for steam generation and other heat duty.

The clean fine coal is mixed with heavy oil recycled from the process to produce a paste. This paste is charged to the liquid phase hydrogenation operation along with a small amount of catalyst. At approximately 10,000 pounds per square inch and at a temperature of 900° F. a large portion of the coal is liquefied. The material leaving this stage of the process is distilled to obtain a light oil and a heavy oil. Part of the heavy oil is recycled to the pasting operation and the remainder is coked to provide a means of rejecting the ash and used catalyst. In a second stage the light oil is hydrogenated over a fixed bed of catalyst at 10,000 pounds per square inch and 900° F. to yield gasoline and liquefied petroleum gas. Certain chemicals (phenol, cresols, xylenols) can be recovered from the first stage product. If not disposed of as chemicals, these products can be processed in the second stage to yield gasoline and liquefied petroleum gas. Con-



W.S.S. RODGERS HEADS NATIONAL PETROLEUM COUNCIL COMMITTEE*

ventional petroleum refining procedures are used for the final treatment of the products from coal hydrogenation operation.

The Committee's estimates for the oil shale operation were based on the assumption that shale is mined in large scale operations according to techniques developed by the Bureau of Mines. The shale from the mines is then crushed to a suitable size and charged to a retort in which the oil is broken out by the action of high temperatures. The necessary heat is obtained by burning—in a separate part of the retort—the carbon remaining in the shale after the oil has been driven out. The crude shale oil thus obtained contains sulphur and nitrogen compounds and is highly unstable. The oil is subjected to coking operation and the resulting coker distillate is catalytically hydrogenated under moderate conditions (1,100#/sq. in. and 835° F.). This hydrogenated distillate yields materials which are processed by conventional means to recover finished and semi-finished products which are transported by pipe line from the plant to a major consuming area. Finishing operations as required are carried on at the pipe line terminus. In each of the coal hydrogenation and oil shale cases the Committee set as a minimum a raw material reserve of 20 years. Costs were based upon operations conducted predominantly for production of gasoline and diesel fuel conforming to present market specifications. All labor, material, and equipment costs were adjusted to January, 1951, levels. The derived product costs do not include allowance for marketing expenses. Chemicals and liquefied gas were credited as by-products in developing primary product costs.

When it was requested that the National Petroleum Council review estimates made by the Bureau of Mines of the cost of producing synthetic liquid fuels, the only datum available from the Bureau on the cost of producing synthetic liquid fuels from coal was its Report of Investigation 4,564, issued in 1949. The Committee found it necessary to escalate these cost estimates to adjust for inflation of material and labor costs. After this adjustment and on the basis of comparable facilities, the Bureau of Mines investment cost estimates were approximately 20 per cent below the cost estimates prepared by the Committee. However, the Bureau of Mines estimates omitted such items as certain off-site facilities, necessary interest on borrowed capital, income taxes, reasonable profit on investment, and treatment of other important capital cost items which the Committee felt need be considered. Detailed analysis of these differences was presented in the subcommittee reports made available to the Bureau of Mines, emphasizing that costs developed by the subcommittee were as authoritative as can be obtained without actual commercial operating experience of the processes considered.

In the case of shale oil operations, the Bureau of Mines had no formal report as a basis of reference for the study made. However, the Committee's representatives worked with the Bureau of Mines people in setting up a processing basis for the oil shale case. The Bureau of Mines personnel generally agreed to accept the subcommittee's estimate of investment and operating costs of producing liquid fuels from oil shale according to the processes reported on at that time. Therefore, the only large difference between the subcommittee and Bureau of Mines estimates in this case was that resulting from capital cost treatment such as interest, taxes, and profit. On the matter of preparing independent cost estimates, the conclusions reached represent the combined efforts of the most qualified people in the petroleum and coal industries. As an independent check, the Committee retained the services of Price Waterhouse & Co. to review procedures and basic accounting data used by the Committee in determining the estimated operating costs for the two processes. Price Waterhouse & Co. necessarily had to accept certain engineering data used in determining these cost figures, but insofar as the estimates used could be tested by the experience of the petroleum industry in refining operations, it was their opinion that the basic accounting data used were computed in accordance with generally accepted accounting principles and that the estimated cost figures developed from such basic accounting data were reasonable.

A summary of the data developed by the Council's Committee follows:

	Coal Hydrogenation	*Oil Shale*
Coal or Shale:		
Tons/Calendar Day	112,590	384,000
Products:		
Barrels (42 gals.) /Calendar Day		
Gasoline	163,830	126,900
Other Liquid Fuels	52,170	74,330
Total Liquid Fuels:		
Barrels /Calendar Day	216,000	201,230
Construction Materials		
Steel: Thousand Tons	1,710	694
Investment:		
Total—Millions of Dollars	4,074	1,518
Cost of Gasoline (with 6 per cent return on investment after income tax):		
Cents/Gallon	43.5	14.7

In the Committee's study, the income tax rate was taken at 50 per cent of income before taxes, and no effect was given to excess profit taxes. Price Waterhouse & Co. stated the "opinion that an annual rate of earnings of not less than 15 per cent on the total capital invested in or retained in a business subject to the risks of a highly competitive and speculative enterprise would be necessary and reasonable in order to attract investment of private capital." This compares with six per cent used by the Committee in its study. The prices which synthetically produced gasoline would have to meet in free competition today are indicated in the following price quotations (as of October 1, 1951) for gasoline at refinery, terminal, or purchaser's bulk plant for four locations in the United States:

	¢/gallon Regular	*¢/gallon Premium*
Los Angeles	12.00	13.30
Denver	12.30	13.30
Salt Lake City	12.625	13.625
St. Louis	12.50	13.50

With regard to making recommendations as to ways and means for improvement of future cost

*Reprinted by permission from the "Texaco Star" Petrochemical issue.

estimates by the Bureau of Mines, the report points out that the preparation of reliable cost estimates is a most complicated and extensive undertaking. During the course of the study, Bureau of Mines representatives had numerous opportunities to review in detail the methods employed by the industry organizations. With this experience to supplement their own backgrounds and with the information which is contained in the technical reports made available to them by the subcommittees, the Bureau of Mines experts should now be in a position to prepare comparable cost estimates for any known or new process combination. An idea of the complexity of the problems and the thoroughness with which the project has been studied is indicated by the following tabulation of the Committee's time and efforts:

Number of subcommittee members	47
Additional technical personnel used	105
Total attendance at meetings (man-days)	590
Number of meetings	197
Number of man-trips	338
Total miles traveled	400,000
Total dollars spent	300,000
Outside companies consulted	115

Since the Bureau of Mines now has sufficient data for proper evaluation, the Committee will continue its work, in order to prepare estimates of the cost of producing synthetic liquid fuels from coal gasification and the Fischer-Tropsch process.

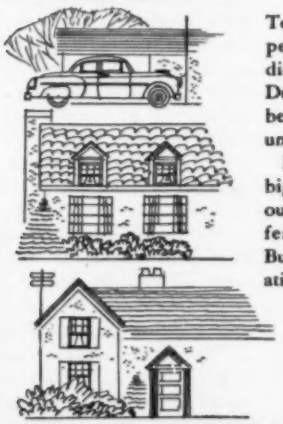
The conclusion reached by the Committee is that coal hydrogenation for the production of synthetic liquid fuels is uneconomical. The oil shale phase of the synthetic fuels program, the Committee found, was in a much more favorable position as to steel requirements, capital cost, and operating costs. It was estimated that known oil shale reserves will yield in excess of 100,000,000,000 barrels of oil. Although excellent work has been done by the Bureau of Mines in the development of shale mining on a large scale, the resulting product costs are still significantly higher than those from petroleum. However, the Committee agreed that this source of fuel warrants continued attention by the petroleum industry.

Illustrated Bulletin

A new 8-page illustrated bulletin describing the improved Staynew Ventilation and Air Conditioning Filters has been announced by the Dollinger Corporation, Rochester, N. Y., manufacturers of filters for industrial needs. The bulletin contains specifications, engineering and performance data covering various types of filters recommended for the removal of dust and other foreign matter by the impingement method. A copy of Bulletin #100 is available from the Dollinger Corporation, 11 Centre Park, Rochester 3, N. Y. Representatives are located in principal cities of the U. S., Canada and Mexico.

One of America's largest single-acting diesels . . .

. . . this HAMILTON unit will bring economical power to Decatur, Ind.



To ensure low power rates for townspeople, this 12-cylinder Hamilton diesel will soon go into service in Decatur, Ind. Over 60 feet long, it will be one of the largest single-acting units ever erected in this country.

Designed to produce 5,880 hp, this big 21½ x 27½ engine will give a net output of 3,810 kw. Unusual efficiency features—plus use of inexpensive Bunker C fuel oil—will give *low* operating costs.

SQUISH ACTION! There's a reason for this economy. In a Hamilton diesel, an *exclusive* rotary valve, an annular wall chamber and a semi-hemispherical combustion chamber *trap 40% more air in the cylinder.*

This extra air is *squished* into the fuel spray cone just as the cylinder approaches top dead-center. There's *complete,* efficient combustion—more power—less engine wear—less maintenance—cleaner, cooler exhaust.

WRITE TODAY! *Remember* there's a conservatively rated Hamilton or Baldwin-De La Vergne diesel for virtually any job in the slow and medium-speed range from 550 to 6860 hp.

BALDWIN-LIMA-HAMILTON

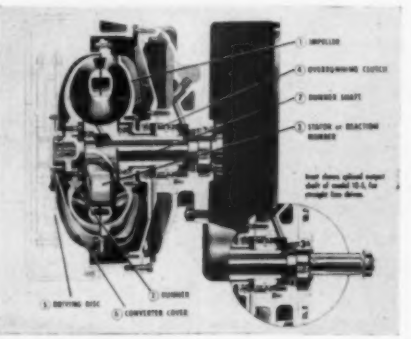
Hamilton Division • Hamilton, Ohio

New Torque Converter Drive

A new torque converter coupling drive designed to handle engines developing from 180 to 225 foot pounds of torque in the 2000-2200 rpm. or higher range, is announced by the Fuller Manufacturing Company of Kalamazoo, Michigan. The new drive offers the advantage of an automatic change from 2:1 torque multiplication to 1:1 coupling operation as torque requirement dictates. Two types of output shafts are available. In model 12-S, a 1½ in. 10 spline shaft is provided for straight line drives with a universal joint. If it is desirable to use sprockets, pulleys, or gears on this model, they should be independently supported in outboard bearings. The model 12-A has a flanged output shaft and an SAE #3 flywheel housing at the rear. This design permits the installation of a second flywheel, automotive clutch and mechanical transmission.

The new converter couplings are proving successful in tow trucks, front-end loaders, route-delivery trucks, travel-loaders, hoists, yard and mine locomotives, logging yarders and other industrial materials handling installations where start-and-stop, heavy load pickups are hard on engine, gears, drive lines, axles and tires, and tiring on operators. Features of this Fuller torque converter design are: 1. No. external oil pump or piping for normal operation. 2. Low oil pressure which protects seals. 3. Self-contained cooling system under normal operating conditions. 4. Fits commercial engines with SAE #3 flywheel housings. 5. Flexible driving disc which corrects for slight misalignment.

This converter is designed to handle engines developing from 180 to 225 ft. lbs. of torque. In order to permit operation in the coupling range part of the time to assist cooling, use with engines having a top speed of 2000 to 2200 rpm. or higher is recommended. The maximum torque multiplication of this converter is approximately 2 to 1. However, this ratio is obtained only when the output shaft is not turning. This is an ideal characteristic for loaders, plows, winches, etc., where the maximum torque is required for short intervals at low shaft speeds. However, when a torque converter is used for propelling a machine or vehicle, account must be taken of the reduced rpm. of the output shaft in conversion range.



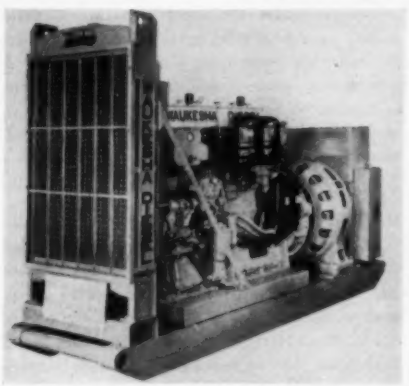
The Fuller industrial torque converter is a single stage design with three simple elements consisting of (1) impeller or pump, (2) runner, and (3) reaction member or stator. The reaction member is mounted on an overrunning clutch (4) which permits rotation with the runner while in coupling range—thus the unit is a two phase design. The change from converter operation to straight hydraulic coupling operation and back is automatic, depending only upon the amount of torque required in the drive line. Power is delivered from the engine flywheel through the thin, flexible driving disc (5) and converter cover (6) to the impeller. Rotation of the impeller throws the oil into the vanes in the runner which is splined to the output or runner shaft (1). The oil in the converter, operating in a closed circuit, leaves the runner at the inner edges of the vanes and enters the reaction member. The vanes in the reaction member are curved so as to turn the oil back into the impeller in the direction of original flow. In the converter range, the reaction member is locked to the housing through the over-running clutch. Thus, the thrust reaction from changing the oil direction by the reaction member vanes is taken by the housing. This thrust load imparted to the oil stream creates the torque multiplication in the unit.

As the torque requirement on the runner shaft is reduced, the runner speed will increase to the point where the oil, emerging at the inner edges of the vanes, will strike the reaction member vanes on the reverse side. The overrunning clutch on which the reaction member is mounted will then permit it to start rotating with the runner. This action changes the unit into a straight hydraulic coupling

which does not multiply the engine torque. Since the oil pressure is slightly higher in the reaction member vanes where its direction is changed than it is at the entrance to the impeller vanes, by-pass circulation to the oil reservoir is created through the small oil passages. Cooling of the oil is accomplished by radiation from the walls of the converter and reservoir. This self-contained radiation system has sufficient capacity to cool the converter under normal operating conditions. However, openings are provided for connecting a radiator or heat exchanger, if additional cooling is required. When a radiator or heat exchanger is used an internal oil passage must be partially plugged. The maximum operating temperature should not run over 250°F.

The oil capacity is 17½ pints, and use of a good grade of straight mineral oil, SAE 10 weight, with no additives or detergents is recommended. The oil pressure is approximately 15 psi. The only service requirement is to check the oil level and cleanliness periodically. Complete information on the new Fuller torque converter will be supplied on request to the Fuller Manufacturing Company (Transmission Division) Kalamazoo, Michigan.

Generator Unit



Pictured above is a Waukesha diesel Model 6-NKDU engine driving a 125 kw., 200 volt, 3 phase, 60 cycle generator at 900 rpm. This is a standardized unit assembled by Frazier Wright Co., distributors for Waukesha engines in Los Angeles, Calif.

To St. Louis Sales Office

Lawrence P. Head

The appointment of Lawrence P. Head as sales engineer to the Cooper-Bessemer regional office at St. Louis has been announced by Stanley E. Johnson, vice president in charge of sales. Working under the direction of W. S. Arthur, district manager, Mr. Head will devote his efforts primarily to the application of diesel engines to marine equipment. A veteran of 22 years' continuous service with this engine and compressor builder, Mr. Head received his initial training at Cooper-Bessemer's factories both at Mount Vernon, Ohio, and at Grove City, Pa. Since 1942, he has been active in the St. Louis territory and has formed many close personal contacts in that territory while installing and servicing diesel equipment. In 1946, he was promoted to district service manager. "The assignment of Mr. Head as sales engineer to the St. Louis regional office is part of Cooper-Bessemer's continuing plan to insure closer contact between its factory engineers and the users of diesel equipment," explains Mr. Johnson. Mr. Head will also continue his previous responsibilities of furnishing helpful engineering guidance and service to all diesel engine operators.

Catalog Published

A 32-page illustrated catalog on all types of Chicago Metal Hose has just been released by Flexonics Corporation, Maywood, Illinois. This catalog covers the full range of the company's manufacture in Rex-Weld corrugated flexible metal hose, Rex-Tube convoluted hose types, and Rex-Flex stainless steel flexible metal hose. Complete specifications are given. Also covered are coupling types, special assemblies, and installation information For a copy write Flexonics Corporation, 1325 South Third Avenue, Maywood, Illinois asking for catalog number CMH-130.

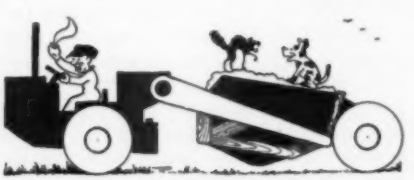
YOUR COPY OF DIESEL ENGINE CATALOG in its seventeenth completely re-edited, revised and expanded edition is now off the press. An invaluable aid to design engineers and buyers, it incorporates the latest diesel engine specifications and descriptions. Order your copy of this limited edition now. Profusely illustrated. $10.00. Mail checks to DIESEL PROGRESS, 816 North La Cienega Blvd., Los Angeles 46, California.

EMD Plant Manager

R. L. Terrell

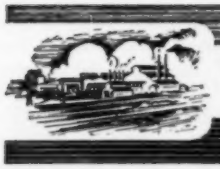
Appointment of R. L. Terrell as manager of Plant No. 3 of Electro-Motive Division of General Motors at Cleveland, Ohio has been announced by N. C. Dezendorf, vice president of General Motors and general manager of the Division at LaGrange, Ill. Effective Sept. 1, Mr. Terrell succeeded Mr. A. G. Finigan who will retire in 1953 and who is being transferred to the staff of the works manager of the Division at LaGrange. All General Motors switching locomotives and part of the production of road switching locomotives are assembled at the Cleveland plant. Mr. Terrell was born in Dayton, Ohio in 1918 and received his early education there. He went to General Motors Research Laboratory in Detroit as an apprentice in 1936. He was in the Army Air Forces for a year and a half as an engine mechanic and returned to General Motors Research Laboratory for a short period before joining Electro-Motive Division as a service engineer in 1939. In 1941 he became an installation engineer on the widely heralded General Motors pancake diesel engine which powered the SC boats. He entered the United States Navy as a lieutenant, junior grade, in 1942 and was sent to England to become an advisor on maintenance of American built engines on the staff of Lord Mountbatten.

Mr. Terrell returned to the Bureau of Ships in Washington in 1943 and until VJ day was head of the Navy's world-wide internal combustion engine reclamation program which included a system of shops not only in the United States but also in Guam, Pearl Harbor, England, Africa and Brazil. He left the Navy in November, 1945, with the rank of lieutenant commander and rejoined Electro-Motive Division. Starting at that time in Washington, D. C. as a sales representative he was made District Sales Manager at Washington in 1946. From 1947 to 1950 he was general parts manager of the Division at LaGrange. While on this assignment he made an outstanding contribution by the development of methods and facilities which have materially improved the availability of replacement parts for American Diesel locomotive use. In March, 1950, Mr. Terrell was made assistant regional manager of the Eastern Region at New York City and in March of this year was promoted to manager of the newly created Southeastern Region which now is headquartered at Jacksonville, Florida. He leaves the Jacksonville post to take his new assignment.



THE final result of this youngster's activity is entirely dependent upon his ability. That's the way we here at Erie Forge approach your problem — we take it over completely — One Control — One Responsibility. Every step — from raw material to finished crank is accomplished here. Design, metallurgical control, casting, heat treating, forging and machining are under the constant watchful supervision of fine craftsmen with many years of experience.

Consult with us on your next requirements for crankshafts, connecting rods or allied items.



ERIE FORGE & STEEL CORPORATION
ERIE, PENNSYLVANIA

Director of Research

Ralph M. Watson

Ralph M. Watson has been named director of research for Worthington Corporation, according to an announcement by H. A. Feldbush, vice president in charge of Engineering. He assumed the post after the reitrement of Paul Diserens July 1st. After working his way through high school and college as a machinist and engineer, Watson was graduated from the California Institute of Technology with a B.S.M.E. degree in 1927. One year later he was graduate as a Masters with honors in Mechanical Engineering from the same Institute. The following nine years he served as engineer in municipal water works in California and as a graduate assistant in the California Institute of Technology. He joined the Worthington organization in 1936 as an engineer in the refinery pumps section of the Centrifugal Pump Division in Harrison, N. J. In 1942 he was made chief engineer of that division and in 1945 assistant to the vice president in charge of Engineering. He is a member of Tau Beta Pi and the American Society of Mechanical Engineers, in which he serves as a member of the Power Test Code Committee on Centrifugal Pumps.

100,000 Visit Exhibit

More than 100,000 architects, heating and ventilating engineers, school and hospital administrators, contractors, railroad operating technicians and other industry representatives viewed Minneapolis-Honeywell's "Parade of Progress" during the 19 months the caravan of automatic control devices was on the road, according to a report recently released. In all, the exhibit covered 24,587 miles, visiting 62 U.S. cities and 10 in Canada. The average stop in each city was from two to five days. The array of products were mounted on 38 displays and transported from city-to-city in a special truck trailer. More than 500 of the company's engineers participated in the local showings of the exhibit. The road tour, which took six months to plan, was developed to accelerate customer understanding of the rapidly increasing application of Honeywell's more than 8,000 different control devices, explains John E. Haines, vice president of the company's commercial division.

Deceased

William E. Morris, Sr., associated with the Shelley Tractor and Equipment Co. of Miami, died suddenly of a heart attack recently. Mr. Morris came to Miami from Homestead, Florida eighteen years ago. After leaving the Firestone Co. he joined the newly organized Shelley Tractor and Equipment Co., distributors for Caterpillar in 1940 and was with them until his death except for the period of time he served in the Navy during World War II. Mr. Morris was a member of the Mahi Shrine, the American Legion and the Elks. Surviving are his wife and two young sons, William, Jr., and Charles, all of Miami.

50 Years in Engine Business

Vincent E. McMullen

Vincent E. McMullen, vice president, Cummins Engine Company, Inc., Columbus, Indiana, is celebrating his 50th year of working in the internal combustion engine industry. Mr. "Mac," as he is affectionately known in Columbus, was born in Dodgeville, Wisconsin, and graduated as an electrical engineer from the University of Wisconsin in 1905. Prior to his graduation, Mr. "Mac" had worked for the Fuller and Johnson Company of Madison, Wisconsin on Engine Testing. This association started in June, 1902. Following his graduation, Mr. McMullen went to work for Baker Manufacturing Company of Evansville, Wisconsin. In 1907 he joined Fairbanks Morse Company of Beloit, Wisconsin and served in the Research Department and as assistant superintendent prior to leaving them in 1912 when he joined Field Brundage Company of Jackson, Michigan as factory superintendent.

In 1914 Mr. "Mac" went with the Hercules Corporation of Evansville, Indiana (manufacturers of small farm engines) and acted as works manager until 1925 when he returned to Fairbanks Morse Company. He stayed with Fairbanks Morse until 1933 and at various times served as superintendent-farm engine department, works manager-electrical motors, and superintendent-foundries. From 1933 to 1935 he was assistant works manager of A. O. Smith Corporation of Milwaukee, Wisconsin. In 1935, Mr. "Mac" was induced to accept a position with the Cummins organization as works manager, with the idea that he would remain active for only perhaps five years. However, in 1942 he was made vice president-general manager and from 1947-1949 he was executive vice president of the company. Since 1949, as senior vice president, he has served in a general advisory capacity, and has continued as a member of the board of directors, to which he was first elected in April, 1946.

Diesels Help "Light Up the Sky"

This display of The National Supply Co., manufacturers of Superior and Atlas diesel engines, attracted much attention at an Airport Lighting Conference sponsored by the American Association of Airport Executives. The conference was held at the Deshler Wallick Hotel, Columbus, Ohio. Francis A. Bolton, of Port Columbus, Columbus, Ohio, (left), the conference manager, and C. R. Seybold, chief, Airport Lighting Section of the Civil Aeronautics Administration, Chicago, (right), are shown with Morris D'Amico, National Supply Co., studying literature on engines suitable for airport lighting. Large background photograph is of National's engine plant at Springfield, Ohio, while other pictures show typical engine installations.

Caterpillar Representative

R. E. (Gene) Sterrett has been appointed by Caterpillar Tractor Co. as special representative and consultant on power for oil drilling equipment in the Tulsa, Okla. area. Mr. Sterrett's services are to be available to all manufacturers and distributors of oil well drilling equipment whose customers are interested in using Caterpillar Diesel Eengine power. He is a graduate of the mechanical engineering school at Kansas University and has a background of actual shop and assembly work at Caterpillar's plant in Peoria, Ill. More recently his experience has been in the company's industrial sales division during which he has worked closely with engine customers in the oil industry.

YOUR COPY OF DIESEL ENGINE CATALOG in its seventeenth completely re-edited, revised and expanded edition is now off the press. An invaluable aid to design engineers and buyers, it incorporates the latest diesel engine specifications and descriptions. Order your copy of this limited edition now. Profusely illustrated. $10.00. Mail checks to DIESEL PROGRESS, 816 North La Cienega Blvd., Los Angeles 46, California.

Selections of Five "Best of the Month" R.E.A. Plants

For the months of May and June the "Best of the Month" REA plants were selected for highest Running Plant Capacity Factors. Top for the two months was plant No. 16A with a R.P.C. % of 91.7 in May and 90.9 in June. Also showing among the five best in both months were plants No.'s 25 and 26 with the latter coming up from third place in May to second place in June and No. 25 in fourth place both months although plant No. 25 improved its R.P.C. % from 81.6 to 83.0. Composite figures for the five ranking plants are reproduced below.

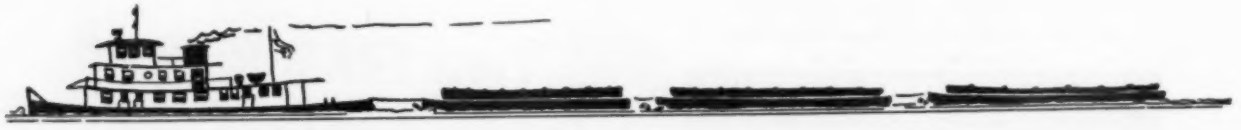
While this particular factor is not the criterion for determining the winner of the annual R.E.A. award sponsored by DIESEL PROGRESS, it is nevertheless a contributing factor in the overall efficiency of the plants. Other criteria will be used from time to time for spotting the five "Best of the Month" plants and ultimately it is expected a reasonably unimpeachable basis will be established for selection of the annual award winner.

U. S. DEPARTMENT OF AGRICULTURE
RURAL ELECTRIFICATION ADMINISTRATION

MAY 1952

COMPARISON OPERATING DATA – CERTAIN REA-FINANCED INTERNAL COMBUSTION GENERATING PLANTS

PLANT NO.	SIZE KW	GROSS M KWH GEN.	STA. SER. %	PLANT FACTOR %	R P C FACTOR %	FUEL – COST OIL ¢/GAL.	FUEL – COST GAS ¢/MCF	BTU PER KWH	HP/HRS. PER GAL. LUBE	MAN-HRS. LABOR OPER.	MAN-HRS. LABOR MAINT.	MAINT. MAT. $	PRODUCTION COSTS MILLS / NET KWH LABOR	FUEL	OTHERS	TOTAL	BEST OF THE MONTH R P C %
16A.	3062	742.0	3.9	31.4	91.7	9.71	-0-	10690	4160	903	24	11.50	2.45	7.83	.52	10.80	91.7
36.	810	255.9	3.2	42.4	89.5	12.75	-0-	11349	2831	591	1180	174.27	5.68	11.07	1.42	18.17	89.5
26.	2210	649.7	2.1	40.8	83.6	9.94	-0-	10760	2350	779	379	725.14	2.56	7.87	2.02	12.47	83.6
25.	2016	516.9	9.6	34.4	81.6	11.50	-0-	10732	3144	862	314	561.81	4.06	9.97	1.71	15.74	81.6
27.	3250	933.7	2.8	38.5	80.8	11.21	-0-	11440	4504	920	248	292.74	1.92	9.55	1.03	12.50	80.8
									JUNE 1952								
16A	3082	723.1	4.0	32.6	90.9	9.70	-0-	10450	2638	852	52	126.64	2.50	7.95	.87	11.32	90.9
26	2210	621.6	2.4	37.9	90.4	9.95	-0-	11500	1548	877	139	228.00	2.75	8.46	1.51	12.72	90.4
3	3580	1472.6	5.0	56.6	83.9	13.64	21.21	10432	4214	993	64	59.52	1.42	2.83	.62	4.87	83.9
25	2016	574.9	9.3	39.6	83.0	11.37	-0-	10721	3460	762	329	785.60	3.36	9.79	1.96	15.11	83.0
48	5400	1453.2	1.9	37.4	79.6	12.97	21.60	10780	3048	1817	173	1099.80	2.66	3.41	1.37	7.46	79.6



Joins Cleveland Office

D. P. Gilbertson

Electric Machinery Mfg. Company, Minneapolis 13, Minnesota, has announced the appointment of Mr. D. P. Gilbertson as a new sales engineer in the E-M Cleveland office. A Navy veteran and a graduate of Iowa State College in electrical engineering, Mr. Gilbertson has had several years of specialized engineering and application experience on large electric motors, generators, and control, in Minneapolis and Chicago. The E-M Cleveland office is located at 1227 Williamson Bldg., 215 Euclid Ave., Cleveland 14, Ohio.

New Medium and Heavy Duty Truck Models

The trend toward lighter but more powerful trucks for highway and off-highway haulers went sharply forward recently with the announcement of new GMC medium and heavy duty truck models by the GMC Truck & Coach Division. Introduction of four new GMC diesel models and many important developments for greater operating economy and driver comfort were highlights of the 1952 GMC 400 and up series models announced by Roger M. Kyes, vice president of General Motors and general manager of the GMC Truck and Coach Division. Three of the new GMC diesels were six-wheelers to meet the growing demand for this type of unit by highway haulers, while the fourth diesel model was introduced to answer the need for light-weight, low-cost diesel power in the 21,000 lb. G.V.W.-45,000 lb. G.C.W. trucking field.

Mr. Kyes said that weight reduction in one of the new GMC model series averaged as much as 865 pounds lighter than the former models. "This means extra payload and lower ton-mile costs for the operator," Mr. Kyes said. "GMC has made substantial weight reductions in most medium and heavy duty models while at the same time increasing G.V.W. and G.C.W. ratings." Other significant new developments in the GMC models were: Shortening of all heavy duty models from bumper to rear of cab to allow use of longer trailers in 45-foot length limit states. Electric shift introduced as standard equipment on all GMC trucks of the 450 and up model series having two-speed axles.

New light-weight, load-cushion springs with fewer but thicker leaves, adding to driver comfort and load safety through smoother ride.

One of the most important features on the new GMC models having two-speed axles is the electric shift, for driver convenience and efficiency. A button mounted on the gear shift lever provides quick and easy shifting by the driver, who merely pushes or pulls the button and the shifting is done by electric power. A new 4900 series Synchromesh transmission is being introduced in all models that previously used the 4450 Synchromesh. It incorporates many new precision features for increased performance and longer life.

Hello, Young Voters!

You've taken this country as your birthplace.

You toddled around and laughed and grew under the sunshine skies of Liberty.

Your fathers and mothers put you to bed each night with the confidence of Freedom, not in furtive fear.

You learned in free schools.

You played ball or skated or jumped rope without a care in the world.

Your stomach was full, your clothes were warm, your roof was sound.

You enjoyed privileges and pleasures, movies and cars, treats and trips like no other youth growing up in the world ever did before.

Now you're of age.

You're full-fledged citizens.

Now it's your turn to pay with a little of your time and some of your thought for a lot of things you received when you were growing up.

The least you can do is to vote to help keep your country the way you want it, lest the children *you're* raising won't have the frank, free years you have had.

Be sure, Young Voters, you're registered!

Be sure, Young Voters, you vote!

Florida Diesel News

By ED DENNIS

ECUADOR, S.A. bound is the re-powered yacht *Arb* from the boat slips of Charles Mills; 3 GM 6-71 diesels with Twin Disc clutches 1:5 to 1 reduction gears, 17 knots at 1700 rpm.

THE *SEA PACK*, a 150x30 foot shrimp trawler and freezer—3 GM 6-71's on each shaft, a 2-71 GM 20 kw. Delco generator for lighting, a 6-71 GM with a 25 kw. Century generator for other purposes, York and Brunner refrigerator compressors; the mother ship for the E. Sooder fleet of shrimp trawlers.

FOR BROWARD ASPHALT CO., a model D-386; 12 cyl. Caterpillar diesel, 383 hp. at 1200 rpm. with a 236 kw. General Electric generator, radiator cooling, complete with fuel tanks; mounted on a trailer to be used in and around a crushed stone plant, from Shelley Tractor Co.

FLORIDA EAST COAST RAILWAY CO. to purchase 23 new diesel locomotives. Federal Judge Louie W. Strum's order authorized the F.E.C. trustees to acquire the 23 locomotives from General Motors Corp. under a railroad equipment lease agreement.

CROSLAND FISHERIES just put into operation the *San Marcos*, a combination shrimp trawler and freezer with 3 GM 6-71 diesels and 2 GM 4-71's for auxiliary power, shrimp capacity is 25 tons; 11,000 gal. fuel tanks. Will operate in Campeche and Texas waters. Paul Davis is skipper.

PIGEON KEY—2 newly installed ReadyPower units with International Harvester diesels model RD9A12, 23 kw., 1200 rpm. Delco batteries. They use SAE #30 DA lube oil with a weekly oil and filter change; daily consumption of City Service #2 fuel oil is about 25 gallons; from Florida Georgia Tractor Co.

STOCK ISLAND—Charles Toppino & Sons Construction Co. received a model NHS Cummins diesel for their 3 yd. Link Belt Speedster crane from Cummins Diesel Engine of Fla.

SUGAR LOAF KEY—The Remerburg Coal Co. has a model D8 Caterpillar tractor and a model D8800 Caterpillar diesel in a one yd. dragline doing construction work.

KEY WEST—The Key West Power Co. recently installed 2 A. G. Schoonmaker Co. units, one at the main station and one at the ball park, a GM V-16 278 A with an Elliott 1375 kva. generator, Harrison oil coolers, 2 Young outdoor radiators with Star Kimble 20 hp. electric motors for engine cooling, GE switch boards, City Service SAE #40 HD lube oil.

WEST SUMMERLAND KEY—2 Witte 12 hp. horizontal engines with 10 kva. generators, exhaust is through an underground salt water well and an enclosed cooling system with a 500 gal. fresh water tank; City Service fuel and lube oil is used.

Two New Offices

The Tocco Division of the Ohio Crankshaft Company, Cleveland, Ohio has announced the opening of a west coast office under the management of Harlan A. Messner. The new office is located at 3349 Union Pacific Avenue, Los Angeles 23, California. Complete engineering, sales and service facilities for Tocco Induction Heating Equipment are now available to west coast industry. Tocco's Chicago office has moved to much larger quarters at 6600 South Nashville Avenue. In addition to the regular sales, engineering and service personnel there is a new laboratory completely equipped for experimental work on Induction Heating applications. Mr. L. C. Schweitzer, Tocco's Chicago district manager for many years, is in charge of the enlarged operation.

Assistant Sales Manager

W. A. Finn has been named assistant general sales manager of Worthington Corporation according to an announcement by T. J. Kehane, assistant vice president and general sales manager. Mr. Finn, who is returning from Paris, France, where he has been serving as general European manager, will now make his new headquarters at Worthington's Harrison, N. J. office. Mr. Finn was graduated from the Naval Academy at Annapolis in 1922 and served in the U. S. Navy until 1926. He then joined Worthington as an application and sales engineer in the Steam Power Division. From 1930 to 1941 he acted as New England district sales manager and then was granted a leave of absence until 1946 to serve with the U. S. Navy. During that time he was graduated from the U. S. Naval War College in Newport, Rhode Island, in December 1942, and served on the staff of the Allied Naval Commander-in-Chief U. S. Expeditionary Force and later as Staff Commander of U. S. Naval Forces in Germany. Upon his retirement with the rank of Captain, USNR, in 1946, he rejoined Worthington as manager of the Export Department.

Brown & Sharpe Promotions

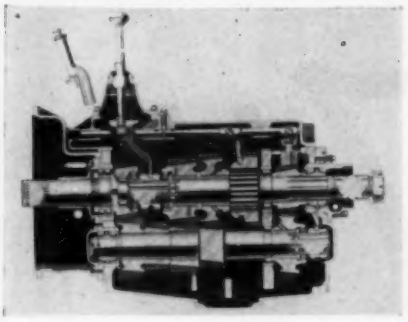
Wallace E. Anderson

Samuel H. Waughtel, Jr.

Wallace E. Anderson has been promoted to division superintendent of the newly created Precision Tool & Gage Division at Brown & Sharpe Mfg. Co., it was announced by Henry D. Sharpe, Jr., president of the company. Samuel H. Waughtel, Jr., was also named division foreman as a part of Mr. Anderson's organization. The creation of this new division is part of a company-wide plan to promote more effective administration throughout the organization and to focus executive attention on future growth of business. Since serving his apprenticeship with the company Mr. Anderson has completed many important assignments in both production and sales. During World War II he was a technical adviser to the War Production Board on machinery and tools and later served as a machine tool expert on the U. S. Strategic Bombing Survey of Germany. Presently, he is a member of the Coordinating Committee of the American Supply & Machinery Manufacturers Association, Inc., and also a member of the Research and Technical Committee of the Metal Cutting Tool Institute.

Mr. Waughtel has been associated with the company since graduating from Princeton in 1937 and has devoted his efforts to manufacturing and to supervising the activities of the various departments in the plant. He recently returned from a special assignment with the N.P.A. in Washington. In his new duties Mr. Waughtel will have full responsibility for the production of precision tools. Ermand L. Watelet will continue in his capacity as director of design for Precision Tools and Gages.

New Truck Transmission



The new Fuller Model 4-FS-1440 transmission engineered for use behind torque converters on the biggest trucks up to 400 hp. has been announced by the Fuller Manufacturing Company of Kalamazoo, Michigan. Development of the 4-FS-1440 was achieved through teamwork between Fuller and leading manufacturers of heavy duty equipment and industrial engines and crowns 50 years of progress on the part of Fuller and the powered-equipment industries, in extending the boundaries of power application in both off-highway and on-highway service. Designed with closely spaced gear ratios and high ratio of capacity to weight, the 4-FS-1440 makes new load-and-road performance possible, particularly in off-highway service. Fuller is building the new transmission specifically to combine with the most advanced torque converters, to provide greatly increased pulling power and versatility under severest hauling conditions, such as open pit mining, logging and heavy construction. With close spaced ratios, the 4-FS-1440, adds to the flexibility of the torque multiplication offered through the converter. With the four forward speeds available, operators have an ample selection of gears to match the widest range of operating conditions—to get the most efficiency, with smooth operation, from the available horsepower.

The 4-FS-1440 offers the following ratios in the four forward speeds: first, 1.98; second, 1.40; third, 1.00; fourth, 0.71. Reverse ratio is 1.61. The clutch housing size is SAE #1. Weight is 775 pounds. For power take-off, the 4-FS-1440 has two SAE standard large openings, short length on both the right and left sides. The 4-FS-1440 also features an oil trough and sump to collect and hold foreign matter, which is easily drained through a clean-out plate at the bottom of the sump. Oil capacity of the 4-FS-1440 is 14½ qts. Complete information on the new 4-FS-1440—with details on use with torque converters—may be had by writing the Fuller Manufacturing Company, Kalamazoo, Michigan.

Publishes New Diesel Combustion Handbook

The second edition of "The Lanova Combustion System for Diesels" is being released by the Lanova Corporation, 38-15 30th Street, Long Island City 1, N. Y. This 58-page fully illustrated booklet describes in non-technical terms the principles of the internal combustion engine and gives a complete and explicit explanation of the Lanova controlled turbulence combustion system, its purpose, advantages and application to the diesel engine. The booklet is conveniently arranged in a step-by-step progression of five parts designed to give a clear, concise picture of what the Lanova combustion system is and the advantages it offers. The first two parts cover the elementary principles of internal combustion engines, highlighting the important part that combustion plays in engine operation.

The last three parts provide a clear explanation of the Lanova combustion system, the advantages it offers the diesel engine, and the fields in which Lanova-type diesels are particularly well adapted. An appendix of useful engineering information with tables, formulas and factors is included in the last few pages of the booklet. This booklet is being offered without charge to diesel engineers, designers, prospective diesel users and others who might have a serious interest in the Lanova combustion system for diesels.

Catalog

A new catalog of diesel parts manufactured by Hunt-Spiller Manufacturing Corp., 383 Dorchester Ave., Boston 27, Mass. has recently been issued. It includes descriptions of a number of typical replacement parts currently produced by the company, all of which are illustrated by comprehensive detail drawings. Copies of this catalog may be secured without obligation upon request to the company.

17th

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Designing and consulting engineers keep DIESEL ENGINE CATALOG at hand for easy reference throughout the year. Product engineers found its accurate, easy-to-find data of great value in their work. Engine operators use its wealth of factual information as an invaluable aid to good maintenance and service. Technical instructors and students consult it as an unsurpassed reference book.

If *you* are not already using Volume Seventeen, it can save you time and money, too.

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Elected Executive Vice-President

Admiral A. G. Noble, USN, Ret.

The election of Admiral A. G. Noble, USN, (Ret.), as executive vice president; a member of the Executive Committee and a member of the Board of Directors of the Nordberg Manufacturing Company, Milwaukee, has been announced by Robert E. Friend, president, and James A. Friend, senior vice president. Admiral Noble comes to Nordberg from Martin-Parry Corp. of Toledo, where he was vice president and general manager since his retirement from the Navy. He will take over his duties as executive vice president of the Nordberg Manufacturing Company on October 1, 1952. A native of Texas, Admiral Noble entered the Naval Academy in 1913, and retired from the Navy in 1951. He has a master's degree in mechanical engineering, awarded by Massachusetts Institute of Technology in 1923.

Prior to his retirement, Admiral Noble served in the Naval Department as Chief of Naval Materiel, where he had been in general charge of the entire Navy procurement program, and before that as Chief of the Bureau of Ordnance for more than three years. In these positions he gained intimate knowledge of the nature and facilities of the American industries producing for the armed services. Admiral Noble participated in World War I as an officer on the USS Delaware, which operated with the British Grand Fleet. During World War II he commanded the Cruiser Phoenix in the Southwest Pacific. He became Chief of Staff to the Commander of the 7th Amphibious Force and later, upon promotion to flag rank, became Commander of Amphibious Group 8. In addition to campaign victory medals, Admiral Noble holds the Navy Cross, Distinguished Service Medal (Navy), Distinguished Service Medal (Army), and the Navy Legion of Merit with two gold stars.

Window Conditioner

The "Tweco Squeegee-Scraper," a new window conditioning tool is being marketed by the Tweco Products Company of Wichita, Kansas. This handy tool has one hard canvass base bakelite scraping edge and one soft rubber squeegee edge. The hard edge will not scratch glass yet has a long life, removing ice, sleet, snow, insects and mud. The soft edge removes fog, frost, water and splatter. The squeegee-scraper is inexpensive and is available at automotive and hardware supply stores.

To Treble Plant Size

Plans for trebling the size of the Jacksonville, Florida branch of Electro-Motive Division of General Motors were announced by Mr. N. C. Dezendorf, vice president of General Motors and general manager of the Division at headquarters at LaGrange, Illinois recently. The branch is one of six in the United States in which Electro-Motive rebuilds major components of diesel locomotives such as generators, traction motors, and diesel engines with factory methods under a new product guarantee. The branches also are replacement parts distribution points. The present Jacksonville plant occupies 26,880 square feet of floor space. This will be enlarged to 77,568 square feet. The new addition will be roughly in the form of a U built around the present plant, with a modern office wing stretching across the front. The Southeastern Regional offices of Electro-Motive Division, recently moved from Washington, D. C. to Jacksonville and now housed in the Atlantic National Bank Building Annex will be located in the new office building at the plant. The enlargement of the activity will mean an eventual increase of Electro-Motive employment in Jacksonville from 34 to approximately 110 persons. Plans call for completion of the construction next spring.

YOUR COPY OF DIESEL ENGINE CATALOG in its seventeenth completely re-edited, revised and expanded edition is now off the press. An invaluable aid to design engineers and buyers, it incorporates the latest diesel engine specifications and descriptions. Order your copy of this limited edition now. Profusely illustrated. $10.00. Mail checks to DIESEL PROGRESS, 816 North La Cienega Blvd., Los Angeles 46, California.

Price Reductions

United States railways have been given notice of major reductions in labor charges upon rebuilding of principal components of diesel locomotives in the national network of six factory rebuild plants of Electro-Motive Division of General Motors. N. C. Dezendorf, vice president of General Motors and general manager of Electro-Motive Division, announced recently that all of Electro-Motive's diesel locomotive customers have been formally advised the labor charge upon strip and rewind of traction motor armatures was reduced 30% and that labor charges upon all other catalogue listed rebuilding operations were reduced 10%. The traction motor armature rewind job constitutes the largest single item in the rapidly growing business of the factory branches.

The reductions are the direct result of technological advances which have drastically reduced costs, Mr. Dezendorf explained. He pointed out that since Electro-Motive went into the business of rebuilding traction motors, generators, engines and other major components of locomotives for the railroads shortly after the close of World War II the average hourly wage rates at the factory branches have gone up 59%. "We not only have been able to completely offset this inflationary influence but now are able to announce these drastic reductions," Mr. Dezendorf said. "This is largely due to a program of complete retooling of the factory branches started two years ago and now almost completed. The program has converted these plants from job shops into true production shops where the same high production methods and machinery used in the original manufacturing operations at the main locomotive plants are duplicated." Electro-Motive now operates plants for these rebuilding operations at La Grange, Ill.; Baltimore, Md.; Jacksonville, Fla.; Los Angeles, Calif.; Oakland, Calif.; and St. Louis, Mo. Land has been purchased for an additional plant at Salt Lake City, Utah.

New Sales Manager

Don E. Sweeney

Don E. Sweeney, formerly associated with General Motors Corporation, is the new sales manager of P&H's Diesel Engine Division, Crystal Lake, Illinois, succeeding R. H. Fitz, according to an announcement from Harnischfeger Corporation. Mr. Sweeney brings to his new position a broad background of experience and ability in the diesel engine field. His seven years with GMC were spent in the Detroit Diesel Engine Division as zone sales representative and zone sales manager. In these capacities he was in charge of all distributor operations for seven mid-western states. During the war years 1941-45, Mr. Sweeney served with Army Ordnance. His supervision included the production, inspection and shipment of tanks built by the Buick Motor Division, GMC. Previously he held the position of district manager for the Michigan Public Service Company and also was associated with Westinghouse Electric Supply Company in a sales capacity.

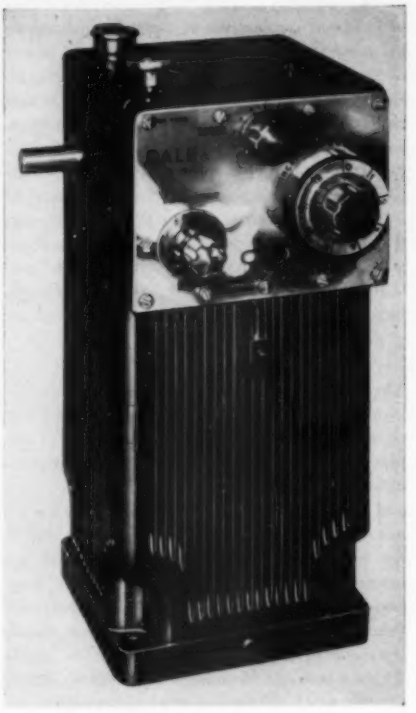
New Governor for Universal Application On Diesel Engines

A new hydraulic governor for universal application to all types of diesel engines is announced by Dale Hydraulic Controls, Inc. Conventional governor principles are augmented by a number of new, highly desirable features in design. The Dale Control has five readily accessible adjustments which eliminate the necessity of changing parts to adapt the unit to the particular requirements of an engine. A self-contained oil supply and a new system of by-pass porting, and subsequent elimination of accumulators, avoids pressure exhaustion and permits effective governing under all speeds and load conditions.

The outer case is of finned aluminum construction for more rapid heat dissipation. A novel linkage arrangement using expansion differentials is incorporated to provide for loss of speeder spring force due to temperature rise. In this manner, temperature changes are adjusted automatically. Further, compensation is not affected by atmospheric pressures. The governor operates equally well at all altitudes. Two needle valves provide adjustment of recovery time on acceleration and deceleration. This exclusive feature permits more rapid recovery without overswing and allows adjustment to the full ability of the engine to recover.

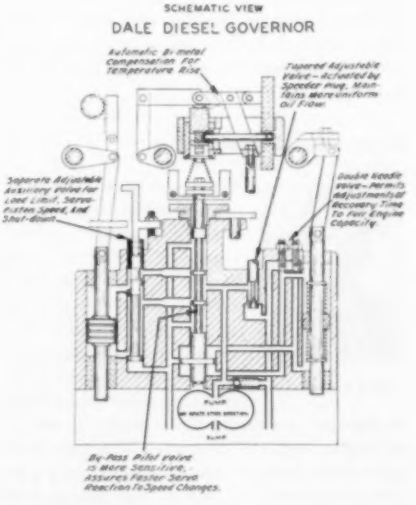
The pilot valve in the Dale Control is designed relatively free of undesirable mechanical linkages, eliminating excessive friction, which in turn increases sensitivity. By-pass type lands (instead of size and size ports and lands) assure quick servo-piston response on small pilot-valve movements. In addition, an adjustable auxiliary valve is used which serves three definite purposes: (1) adjustment of servo-piston speed; (2) as a by-pass valve to give load limiting; (3) provides positive shut-down of engine. This valve may be operated manually, by solenoid, or by other means for shut-down. The entire unit is built to high precision standards to assure long service life under severe operating conditions.

For variable speed applications, such as turbo supercharged engines, where it is desirable to have a time lapse in going from "no load" idling speed to "full load—full speed," a special device is incorporated to adjust this interval from 0 to one minute, or any increment in between. For diesel electric drives, an external speed adjustment is unnecessary. The governor controls engine speed as load is applied. Thus, at "no load," engine will operate at idling speed and as load is applied, the engine will increase speed until "full load—full speed" is attained. For further information address File 100, DIESEL PROGRESS, P.O. Box 8458, Los Angeles 46, Calif.



The New Dale Diesel Governor.

Schematic view of the Dale Diesel Governor showing five of its highlighted features.



Inland River Reports

By DAVID I. DAY

TO REPLACE the steamer *Montgomery*, the Federal Barge Lines are having a new diesel vessel built at the Sturgeon Bay, Wis., shipyards at a low bid of $360,378. The boat will be 120 x 35 x 11 and will be powered by Nordberg engines. They will furnish 1800 hp. to the twin screws.

THE NEW Fairbanks-Morse twin-engined *C. F. Hood* is now at work for her owners, the U. S. Steel Co., Pittsburgh, Pa. The vessel was recently completed at the yards of St. Louis Shipbuilding & Steel. She is rated at 1280 hp., and first news reveal excellent performance.

WE BELIEVE the M.C. *Claude Tully* of the Patton-Tully Transportation Co., Memphis, Tenn., holds a sort of towing record on the Intracoastal Canal. We understand in nine round trips with a 3-barge tow of crude oil from Ostricia, La., to Port Arthur, Texas, she has carried nearly 400,000 barrels, most of it in one 30-day period. For years the *Tully* has been one of the most dependable boats on the waterways. She has twin Fairbanks-Morse engines generating 3200 hp.

The *A. M. Thompson* of the Central Barge Company, Chicago, has been since her launching in 1949 one of the best advertisements afloat for the Enterprise engine people and for the builders, Calumet Shipyard & Dry Dock Co., Chicago. She set records in 1950 and 1951 in towing coal up the Mississippi to Minneapolis and St. Paul. She is repeating in 1952. On our August trip, we observed her heading up river with 12 huge barges of the black diamond. She is rated at 2600 hp.

ANOTHER big steamer seems gradually fading out of the picture. The *Alexander Mackenzie*, long a big factor in coal towing on the Illinois and upper Mississippi for the Central Barge Co., has been towed over to Cincinnati on the Ohio by the motor vessel Central. For the time the steamer will serve there as an extra but the understanding is she is headed for the discard.

The towboat *St. Paul* was recently completed by the Twin City Barge & Towing Company, St. Paul, Minn. This is said to be the first diesel boat ever built there. The builders will operate the vessel in local trades. Powered by three 275 hp. GM's.

So far as we know, the record of the tug *Jeannette-E* of the Texas Towing Co., Houston, made recently on the canal from Corpus Christi, Tex., to Pensacola, Fla., and return in 133 running hours is tops. Going east the tug had two loaded barges but returned to Texas with empties. This tug was built at the Vance Shipyards in Houston in 1945. She is powered with one 800 hp. Enterprise engine.

WE WERE pleased to receive from Texas readers a recent picture of the popular tug *Mercury* of the fleet of the Commercial Petroleum & Transport Co., Houston. Her chief engineer handling the 700 hp. General Motors engine is Ervin LeBlanc. The tug is shown pushing 40,000 barrels of oil in a pair of integrated barges.

THE *Fred W. Olcott*, 3200-hp. pusher, using General Motors twins, is making a reputation for herself towing for the Gulf Oil Corporation from near Cincinnati to Pittsburgh.

THE NEW *Barry Dean* of the Rose Barge Line, with her 400 hp. Caterpillar diesel engine was noted at work recently on the Tennessee River towing 3600 tons of grain from Pekin, Ill., on the Illinois to Guntersville, Ala., in command of Capt. R. V. Bass with Earl Rose, Sr., in charge of the engine room. The boat was handling the jumbo barges like a veteran.

Her old Atlas diesel engine still performing in the 200 hp. class, the wood-hulled sternwheeler *Coal City* is back at work for the McClain Sand Company out of home port, Point Marion on the Monongahela River. This boat started working back in 1935. She is now resplendent with new paint, white, green, and red.

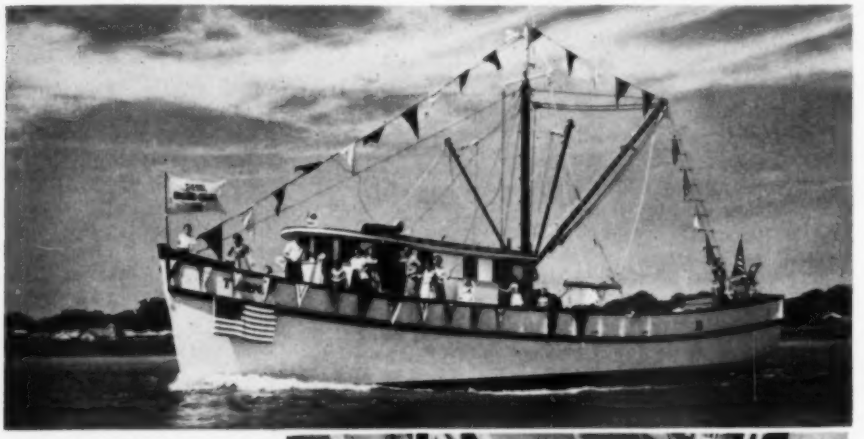
NEWSPAPER publicity was plentiful this month when Aiken Towing Company sold the diesel tug *Nellie* to W. S. Rosaco, Jr., 400 hp., Cooper-Bessemer at work. Originally a steamer, the tug was built in 1875 or 1880. Years ago the little vessel rode out a hurricane on the gulf. She has had a wide variety of triumphs and tragedies. Charles H. Johnson, chief engineer, has been on the tug for years.

LAUNCHES 300th SHRIMPER

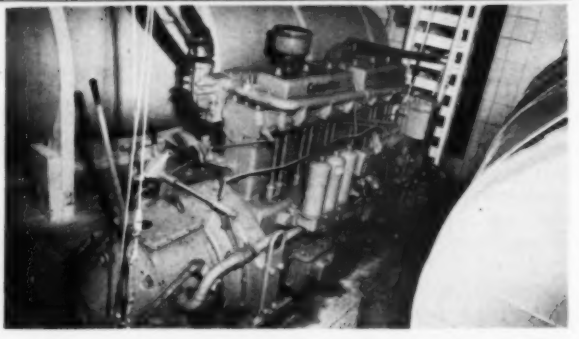
Diesel Engine Sales Co. of St. Augustine, Florida launched its 300th craft, when the trim, 67-ft. trawler *Tern* slid down the way and into the waters of the San Sebastian River. The vessel was christened by Mrs. Marvin Hardee, wife of the owner, and will join the Hardee shrimp fleet at Morgan City, La. as a fitting tribute to the shrimping industry. Like the other 299 vessels launched by Diesel Engine Sales Co. since 1943, Mr. Hardee's new Tams designed shrimp trawler is the best in craftsmanship. After launching, Mr. L. C. Ringhaver, president and manager of Diesel Engine Sales Co., was host at a typical southern barbecue on the shores of the San Sebastian River.

Under Mr. Ringhaver's management, this shipbuilding firm has grown to great importance to the shrimping industry since it started in 1943 when the first trawler, *M. A. Bowlin* was launched. The firm employs about 200 workmen and means much to St. Augustine, Florida's oldest fishing port. Vessels built at this plant are seeing service in waters in many parts of the country, from the fishing fleets of the New England States clear down and across to the Gulf of Mexico.

The *Tern's* D 13000 Caterpillar diesel engine was supplied by the Gibbs Corp. of Jacksonville; some of the other features are: keel cooling, Snow Nabstedt clutch and 3:1 reduction gears, Delco Remy starting generator, Southway batteries, Gould bilge pumps and with the 48x44 4 blade Columbian propeller her speed was 10 knots on the trial run. The 27 ton shrimp hold capacity and 4000 gal fuel oil capacity of this new trawler probably means: *Campechee*!



The newly launched *Tern* on its first run down the San Sebastian River. This craft is the fourth of the shrimp fleet owned by Marvin Hardee.



The engine room of the *Tern* showing its D13000 Caterpillar diesel engine.

West Coast Diesel News

By FRED BURT

PURCHASED by the Bureau of Wild Life to supply lights and power at the California State Game refuge east of Las Vegas, a 5-kw. Witte diesel generating set; with one cyl., 10-hp. water-cooled diesel.

FROM Oswald Machine Works, San Francisco, Murphy diesels for re-powering: M & K Constr. Co., San Francisco, 150-hp. unit for Northwest power shovel; Calif. Barrell Co., Arcadia, Calif., 135-hp. unit for P & H dragline.

FOR Peerless Pump Co., Los Angeles, a 6-hp., 1-cyl., air-cooled Sheppard diesel to power a water pump for use at small irrigation project near Morado, Texas.

SUPPLIED BY Engine Sales & Service, Los Angeles, a 6-cyl. 150-hp. P & H diesel power unit to power a rock crusher to supply pea gravel for U. S. Army Engineers road building operations around Fort Huachuca, Ariz.

LAUNCHED THE same day at Sterling Shipyards, Vancouver, B.C. were two seiners; the 75 ft. *Elling K*, Knute Floe, skipper; powered with a 275-hp. Caterpillar diesel; and the 65 ft. *Cape Ross* with a 165 ft. Caterpillar diesel, Chris Cook, skipper.

FOR POWERING a Madsen Iron Works asphalt plant a Murphy diesel-generating set; for use on a road-building job near Yuma, Ariz.; Hueser & Garnett, of Glendale, Calif., contractors and owners.

BUILT IN 1917, Fishermen's Packing Corporation's (Anacortes, Wash.) purse seiner *Locks*, started out with a gasoline engine for power, followed by a used diesel; now re-powered with a new 190-hp. Murphy diesel which Capt. Jack Rapanich says will make the *Locks* good for another 35 years.

RECENT Union diesel-generating set constructions and installations—Two 500-kw. sets for Atomic Energy Commission based on Union P6, supercharged, 900-hp. @ 500 rpm. diesels; Ideal Electric & Mfg. Co. generators; Carrier evaporator coolers; Woodward and Pierce governors, on this and other installations listed; also Brown Exhaust Gas Pyrometers and Union Oil Coolers on all units; Federal-Mogul main bearings.

THREE PREVIOUS dual fuel Union Diesel engines were installed in the technical area of the Atomic Energy Commission's factory at Sandia Base, Albuquerque, New Mexico.

FOR THE Naval Mine Depot, Yorktown, Va., two Union 500-kw., generating sets, with P-6 diesels and Ideal electrical equipment, are under construction.

TWO 800-kw. Union diesel generating sets, with General Electric electrical equipment, have been completed and shipped to Wahiawa, Oahu, Territory of Hawaii with installation to be completed before 1953.

SUPPLIED ON a prime contract with the Navy Dept., three 600-kw. Union diesel sets with Westinghouse generators and Buffalo Forge evaporating coolers, have been delivered to Monogram Field, Virginia for early installation.

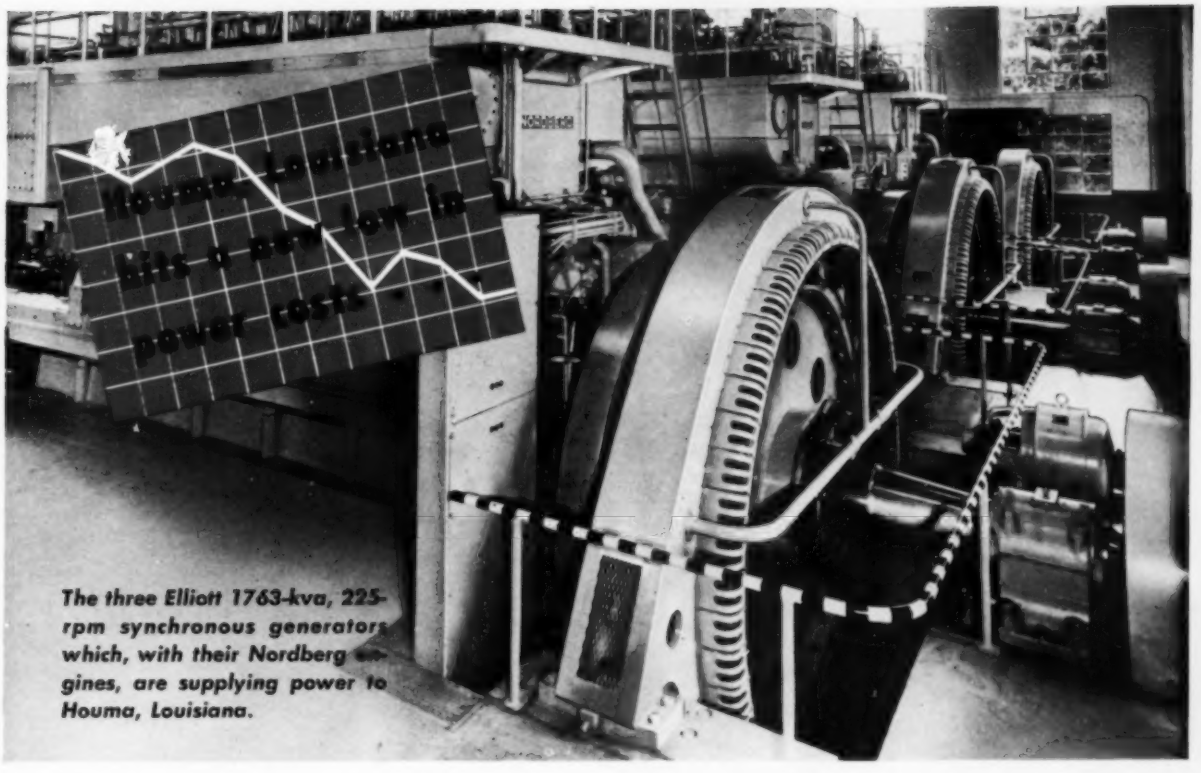
TO REPLACE a gasoline engine in re-powering a No. 6 Northwest shovel, a 165-hp. Murphy diesel, by contractor Silva Rameros, Needles, for use on Mexican government road-building and ditching work in Sonora and Baja California.

FROM Cummins Service & Sales, Los Angeles, to T. M. Page Corp., Monrovia contractors, three 175-hp., 6-cyl. Cummins diesels to re-power Super C Tournapulls (fast, heavy earth-moving equipment).

FOR Gibson Mfg. Co., Seattle to re-power a Northern Pacific railcar, a 135-hp. GM diesel; operation report states a top speed of 50-mph. easily obtained with 50% more mileage from tank of fuel than with old gasoline engine.

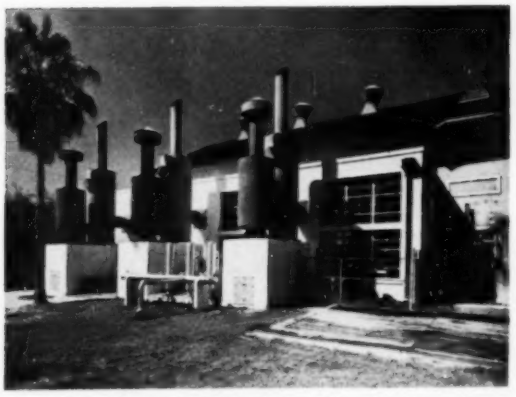
FOR USE in its 8th and Alameda St. Railroad yards, Los Angeles, Pacific Electric has recently repowered a 30 ton Plymouth locomotive with a Cummins HRS diesel and Twin Disc torque converter.

ADVERTISERS' INDEX



The three Elliott 1763-kva, 225-rpm synchronous generators which, with their Nordberg engines, are supplying power to Houma, Louisiana.

Three Elliott Generators



View of the Houma Municipal Plant, showing the exhaust and intake silencers for the three new diesel engines.

on the business ends of Nordberg duafuel five-cylinder diesels, are spinning out kilowatts for the enterprising Louisiana city of Houma, and at a gratifyingly low overall cost.

The installation represents a modernization program undertaken in 1949, which almost triples plant capacity over former output. The previous equipment now provides standby service only. The three new engines operate on natural gas, each developing 2000 hp at 225 rpm. The Elliott generators are each rated 1765 kva, 80 per cent power factor, 3 phase, 60 cycle, 2400/4160 volts.

Congratulations are due the engineers of Houma for the skilled administration which combines with superior equipment for exceptional economy in city power costs.

For details about Elliott generators and motors, contact your local Elliott representative or write Elliott Company, Ridgway, Pa.

ELLIOTT Company

RIDGWAY DIVISION

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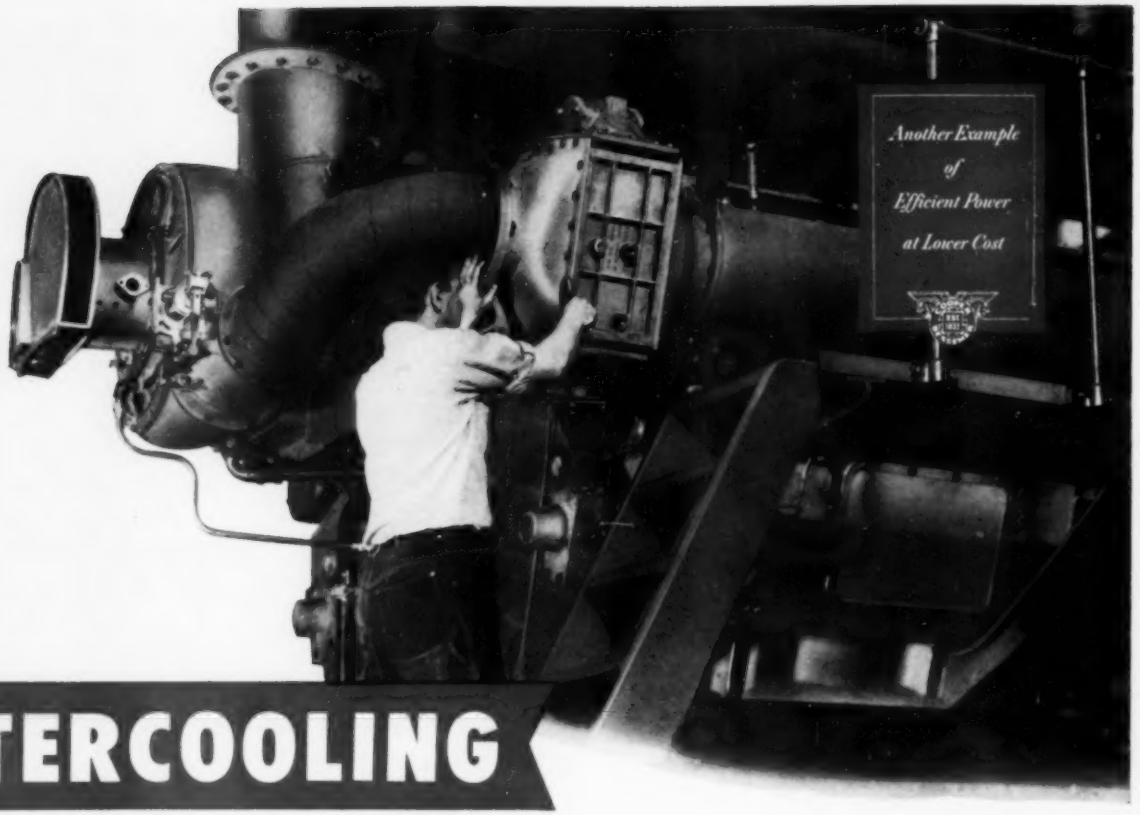

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